



# CHEMICAL ABSTRACTS

Vol. 15.

APRIL 20, 1921.

No. 8

## I—APPARATUS

C. G. DERRICK

**New laboratory devices.** P. VAN DER WIELEN. *Pharm. Weekblad* 58, 193(1921).—Announces a lecture demonstration of an *app. for filling ampoules* with a certain amt. of liquid; a device for *filling and sterilizing* a large number of ampoules in vacuo; a *dialysis app.*; an electrically heated *hot-water funnel*; a *suppository* of the torpedo form; and a *const.-temp. app.* for the range 30–50°, consisting of a flower pot warmed by an elec. lamp of appropriate size.

JULIAN F. SMITH

**A new nephelometer and the principles of nephelometric measurements.** HANS KLEINMANN. *Kolloid-Z.* 27, 236–41(1920).—See *C. A.* 14, 2357.

E. J. C.

**A Soxhlet extractor for extraction with hot solvents.** LEO SOEP. *Chem. Weekblad* 18, 97(1921).—In a Soxhlet extractor the side tube, instead of rising vertically, is fused into the extn. chamber near the bottom and rises spirally to the usual level, with space in the center for the extn. thimble. The condensed solvent is thus warmed by the rising vapor.

JULIAN F. SMITH

**Works standardization of pyrometers.** R. GATHS. *J. Inst. Elec. Eng.* (London) 57, 317–21(1920).

C. G. F.

**The limitations of the stop watch as a precision instrument.** A. L. ELLIS. *J. Am. Inst. Elec. Eng.* 40, 104–12(1921); 22 illus.

C. G. F.

**Some thermal characteristics of electric ovens** (GRIFFITHS, SCHOFIELD) 4. **Automatic control of chemical reactions** (EDELMAN) 13.

**Liquid seals for regulating fluid flow.** SVENSKA AKTIEBOLAGET MONO. *Brit.* 154,930, Dec. 6, 1920. A liquid seal device particularly applicable for use with gas-analyzing app. is so constructed that the sealing liquid is forced by the incoming fluid to pass into a secondary chamber and allow the seal to fall to or below the mouth of the supply pipe. A suitable app. is specified.

**Specific gravity and liquid-level indicators.** PNEUMERCATOR CO. *Brit.* 154,621, Dec. 2, 1920. App. is specified for measuring the depth, vol., sp. gr., and wt. of liquid in a tank of the type in which air pressure is developed to balance the head of a liquid above a reference level against an indicating column.

**Recording densimeter.** I. P. PARKHURST and R. O. NEAL. *U. S.* 1,368,524, Feb. 15. Liquid, the density of which is to be indicated on a continuous record, is passed through a receptacle containing a float connected with a recording needle or pen at its upper end. A rod from the lower end of the float dips into an open end of a U-tube containing Hg and the other end of the U-tube is connected with a coil of pipe within the receptacle. This coil contains a liquid, such as toluene, which expands with any rise in temp. of the liquid flowing through the receptacle, thus forcing up the Hg in the open end of the U-tube and slightly elevating the float to compensate for the variation which would otherwise be indicated on the record due to the change in temp. By suitable adjustment of the app. a record may thus be obtained which is automatically corrected for temp. variations of the liquid tested.

**Electric apparatus for ozonizing air.** R. L. JOSEPH. *U. S.* 1,368,560, Feb. 15.

Apparatus for ozonizing liquids. A. J. MOISANT. U. S. 1,368,346, Feb. 15, 1921. The app. is adapted for ozonizing  $H_2O$  or oils.

Filtering and decanting apparatus. B. H. BERNETTS. U. S. 1,368,617, Feb. 15, 1921. The app. comprizes a row of beakers or other receptacles mounted upon a suitable support to facilitate their simultaneous emptying into a row of adjacent filtering funnels.

Rotary filter for chemical and metallurgical purposes. H. B. PARKER. U. S. 1,368,618, Feb. 15, 1921.

Gas-filter. W. M. BOVARD. U. S. 1,368,540, Feb. 15, 1921. A filter suitable for use in removing suspended solids from gases is formed of a porous mat of vegetable and animal fibers and porous mineral material, e. g., a mixt. of rag or wood fiber, wool and diatomaceous earth.

Drying varnished paper, etc. J. W. WILSON. Brit. 154,764, Oct. 15, 1919. This patent relates to drying app. of the type in which varnished, painted or like paper, etc., is dried by means of heated air. It consists in the provision of a heater in which the air is heated without contact with the products of combustion. A suitable construction is specified.

Superheaters for air, vapor or gas. FRED O. BYNOX. Can. 209832, Mar. 29, 1921.—An oblong or rectangular superheating chamber is divided into two compartments by a removable sliding diaphragm placed at a slant to provide a passage of gradually increasing sectional area from the inlet to the outlet.

Roasting furnaces. G. GRÖNDAL. Can. 209,863, Mar. 29, 1921. The furnace roof is movable relative to the hearth and has depending rabbles designed to feed the material being treated through the furnace in successive steps.

Mechanical roasting furnaces. GEORG STÖHN. Can. 209,930, Mar. 29, 1921. A furnace having superposed roasting chambers has alternate stationary hearths and rotary hearths operated from the periphery and each hearth has individual driving means, which may be provided with a reversing gear for forward and backward rotation of the hearth.

Combined boiling, crystallizing and calcining furnaces. ALEXANDER ROY. Can. 210,006, Mar. 29, 1921. The app. comprizes a calcining, a drying, a crystg. and a boiling chamber opening successively the one into the other, and means for supplying a heating medium to the calcining chamber.

## 2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON

J. C. Cain. M. O. FORSTER. *J. Soc. Chem. Ind.* 40, 58R(1921).—Obituary. E. H.

Standardization of college courses in chemistry. STEPHEN POPOFF. *Chem. Bull.* (Chicago) 8, 62-3(1921). E. J. C.

Reform in the training of the chemist. PETER WULFF. *Z. angew. Chem.* 34, Aufsatzteil 41(1921). E. J. C.

The origin and development of the research associations established by the department for scientific and industrial research. A. ABBOTT. *J. Roy. Soc. Arts* 69, 191-205(1921). E. J. C.

Perkin Medal award (to Willis R. Whitney). *J. Ind. Eng. Chem.* 13, 158-66(1921). Willis R. Whitney. A. D. LITTLE. *Ibid* 158-60.—Interesting personal observations. Presentation address. CHARLES F. CHANDLER. *Ibid* 160-1.—This survey of achievements is accompanied by a list of forty-four papers published by Whitney. The biggest things in chemistry. WILLIS R. WHITNEY. *Ibid* 161-6.—Almost inconceivably great strides in countless lines constitute our modern chemistry.

"One of the biggest things in chemistry for us to-day is to learn how to bring about the productive teaching of chemistry." The value of research is emphasized. "The biggest thing of all in research is the mental effect, the projecting of a beam of light into the infinite and the growth of man's appreciation." "The only perpetual motion is the growth of truth." "Research is appreciation."

E. J. C.

Willis Rodney Whitney. ANON. *Elec. World* 77, 636(1921); 1 illus.—Brief biographical sketch.

C. G. F.

The value of the Stock nomenclature for chemical teaching, with remarks on the symbols for the elements. O. OHMANN. Berlin. *Z. angew. Chem.* 33, I, 326-7 (1920); cf. *C. A.* 14, 1941, 3549.—The names proposed by Stock, i. e., iron (2) sulfate for ferrous sulfate, etc., are commended to teachers and some comments are made on German chemical names. The author thinks some of the elementary symbols should be changed, e. g., Th suggests thallium and thulium as well as thorium and should be changed to To.

A. M. PATTERSON

Twenty-seventh annual report of Committee on Atomic Weights. Determinations published during 1920. GREGORY PAUL BAXTER. *J. Am. Chem. Soc.* 43, 383-90 (1921).—The only change from the table of 1919 is in the at. wt. of Se (from 44.1 to 45.1). Work is reviewed on C, F, Al, Si, Sc, Sn, Te, Sa, Tm, radioactive Pb, Th-Pb and Bi.

E. J. C.

Periodic classification of the elements. J. R. PARTINGTON. *Chem. News* 121, 304(1920).—A single spiral arrangement in which the at. numbers of the elements are used. The Soddy-Fajans relation is clearly apparent, and the classification is stated as having many advantages over the one commonly used and as being better than the double spiral arrangement of Nodder (*C. A.* 15, 781).

G. W. STRATTON

Results and problems of modern chemical investigations of valence. WILHELM BILTZ. *Z. angew. Chem.* 33, I, 313-7(1920).—This lecture delivered at the General Meeting of the Verein deutscher Chemiker, Sept. 11, 1920, at Hannover, reviews recent work on valence: Valence-number; valence-work or affinity; and valence-force. The first is found by analytical means, and the other two are found by thermal methods. Also in *Pharm. Monatshefte* 1, 181-2.

JAMES M. BELL

The phase rule. HENRI LECHATELIER. *Compt. rend.* 171, 1033-8(1920).—A simple proof of the phase rule by the method of Gibbs.

F. R. BICHOWSKY

The role of mathematics in chemistry. HENRI LECHATELIER. *Chimie & industrie* 4, 678-9(1920).—A plea for the teaching of mathematics in connection with chemistry in French industrial schools.

F. R. BICHOWSKY

The optical rotation of mixtures of sucrose, glucose and fructose. WARREN C. VOSBURGH. Columbia Univ. *J. Am. Chem. Soc.* 43, 219-32(1921).—In the present investigation the errors in following a sugar hydrolysis by the polariscopic method have been detd. with greater precision than hitherto, and the effect of the presence of other sugars on the sp. rotation of fructose has been measured. It has been observed that the angular rotation of an invert sugar is equal to  $\frac{1}{2}$  the algebraic sum of the rotations of solns. of glucose and fructose of the same concns., and that the sp. rotations of these 2 sugars in their mixts. are those which they would have if each were present alone at a concn. equal to the total sugar concn. This last relation is only approx. for mixts. of fructose and sucrose. It has been shown that the presence of a const. amt. of HCl (conc. = 0.1 M), NaCl (conc. = 1.0 M), or  $\text{Na}_2\text{CO}_3$  (conc. = 0.02 M) has no effect on the detn. of the % of sucrose replaced by invert sugar when the rotations of these are detd. under the same conditions as in the case of the mixts. The error introduced by the use of the polariscopic method is such as to cause neither increasing nor decreasing velocity coeffs., but causes their values to be 0.4% too high when Na light is employed. This error is quite appreciably less when Hg-vapor light is used.

H. JERMAIN CREIGHTON

**Anomalous osmosis with gold beater's skin membrane—chloride solns. in the presence of acids and bases.** F. E. BARTLE AND O. E. MADSON. *J. Phys. Chem.* 24, 563-607(1920); cf. *C. A.*, 14, 2379.—In continuation of previous work and with the same apparatus and methods, the effect of the presence of different concns. of acids and bases upon the osmose of chloride solns. is studied. The object is to test the fundamental hypothesis that by altering the sign of the charge of the membrane (by having present acids or bases), the osmotic effects may be greatly altered. The results show clearly that the presence of acid or alkali not only may alter the elec. sign of the capillary wall system, but also may alter, or even reverse, the elec. sign of the membrane system. The fact is brought out also that the direction of the osmose and its magnitude are closely related to the elec. orientation of the cell system. For purposes of comparison the e. m. f. of 0.05 *M* chlorides with  $\text{HNO}_3$  and  $\text{NaOH}$  throughout the system is detd.

G. I. CLARK

**Molecular transformations in thin films on the surface of water.** HENRI LABROUSTE. *Ann. phys.* 14, 184-238(1920).—This long paper contains a more general discussion of thin films than the title indicates. It begins with a short historical review of the well known work of Rayleigh, Devaux and Marcellin. (American work is completely neglected.) The next part deals with the method of observation of the extent of the film. The usual methods are not convenient at the higher temps, but it has been found satisfactory to observe the shadow cast by the surface when illuminated from above by parallel light. If a jet of air is directed from a fine tube upon the partially covered surface of the water, a sharp, bright circle marks the border of the oil-covered part. If the surface is completely covered no such effect is obtained. By expt. it is found that the extent of the covered surface is not affected. There follows a discussion of the methods of applying the film. Generally the oil was dissolved in a volatile solvent and an amt. of the soln. used which gave just less than enough of the oil to cover the surface. The exptl. work was done on myristic, palmitic and stearic acids, cetyl alcohol, trilaurein, trimyristin, tripalmitin, and tristearin. Each of these substances has a m. p. below the b. p. of water. A film of each of these was deposited on water and the area covered was measured at different temps. In general there is a sharp, reversible change in area at a temp. below the ordinary m. p. In all cases the change of area is about 60% and would be satisfactorily accounted for by an association of 4 mols.

E. D. WILLIAMSON

**Viscosity of liquids. V. Ideality of the system: benzene-benzyl benzoate and the validity of the Bingham fluidity formula.** JAMES KENDALL AND KENNETH POTTER MONROE. *J. Am. Chem. Soc.* 43, 115-25(1921).—The authors maintain that benzene and benzyl benzoate form an ideal mixt. (*C. A.* 11, 2850), and refute the arguments of Bingham and Sarver (*C. A.* 15, 5) to the contrary. The ideal mixt. formula remains to be discovered. (Cf. *C. A.* 14, 3551.)

E. C. BINGHAM

**The distribution of a strong electrolyte between benzene and water.** ARTHUR E. HILL. *N. Y. Univ. J. Am. Chem. Soc.* 43, 254-68(1921).— $\text{AgClO}_4$  is soluble in  $\text{C}_6\text{H}_6\text{Cl}$ ,  $\text{C}_6\text{H}_5\text{CH}_3$ ,  $\text{C}_6\text{H}_5\text{NO}_2$ ,  $\text{CH}_3\text{COOH}$ ,  $\text{C}_6\text{H}_5(\text{OH})_2$ ,  $\text{C}_6\text{H}_6$  (45.2 per 1.), and  $\text{H}_2\text{O}$  (2386.0 g. per 1.). In  $\text{C}_6\text{H}_6$  soln. the salt exists as single mols. and double and triple polymerized mols., the mol. wt. being expressed up to 0.14 *N* by  $C^{0.17}/(1.571 \times 10^{-4})$ , in which *C* is the concn. in gram equivalents per l. An approx. method enables calcg. the concn. of the 3 different species, from which curves are drawn. Thus in 0.14 *N* soln. with av. mol. wt. of 455.6, the concns. for single, double and triple mols. are resp., 0.019113, 0.012865 and 0.031720. There is no evidence of ionization in this soln. Distribution expts. show that  $\text{H}_2\text{O}$  extracts  $\text{AgClO}_4$  completely from  $\text{C}_6\text{H}_6$  soln. up to 2.3 *N* in the aq. layer, giving a ratio of 46,650 instead of 506 calcd. on ordinary assumptions. This fact is interpreted as evidence that the salt is completely ionized in solns. as concd. even as 2.3 *N*.

G. I. CLARK

**Influence of chloride upon solubility of chlorate and the effect of temperature.** JAW BRUNNER. *Monatsh.* 41, 387-95(1920).—The volume soly. of  $\text{NaClO}_3$  in  $\text{H}_2\text{O}$  and in  $\text{NaCl}$  solns. increases with the increase in temp. as a linear function. The following figures are the g. of  $\text{NaClO}_3$  in 100 cc.  $\text{H}_2\text{O}$ , 10%  $\text{NaCl}$ , 20%  $\text{NaCl}$  and 32%  $\text{NaCl}$  at various temps.: 20°, 72.3, 66, 57.4, 41.8; 40°, 82, 75, 65, 43; 60°, 91.3, 83.5, 70, 42.4; 80°, 100.2, 92, 77, 43.3; 100°, 111, 102, 87, 44. These indicate that the decrease in soly. caused by the  $\text{NaCl}$  is greater at the higher temps. It is specially marked with the 32% soln. At 20° the decrease in soly. in 32%  $\text{NaCl}$  as compared with  $\text{H}_2\text{O}$  is 42%, while at 100°, it is 61.4%. From thermodynamic considerations it may be stated that the heat of soln. of  $\text{NaClO}_3$  in concd.  $\text{NaCl}$  solns. decreases with increasing temp. and that the soly. of  $\text{NaCl}$  by  $\text{NaClO}_3$  would be decreased more at higher temps. than at lower temps. C. J. WAST

**The speed of reaction of metallic magnesium in aqueous solutions.** ANT. VYSKOČIL. *Chem. Listy* 14, 121-3, 142-5, 166-71, 189-91(1920).—The Nernst-Brunner equation cannot be applied to the speed of reaction of metallic Mg in aqueous solns. of  $\text{NH}_4$  salts. When Mg is dissolved in solns. of salts of  $\text{NH}_4$  or neutral metallic salts, it first decomposes the water. Then if the soln. is nearly neutral the speed of reaction depends to a great extent on the oxidizing or reducing power of the soln. in question. The reason advanced by Kistiakowski-Barborovsky (*C. A.* 4, 1429) for the electrochemical potential of metallic Mg in aqueous salt solns. is considered to be proved by kinetic analysis. Metallic Mg can be rendered temporarily passive for certain reactions. During the decomposition of water by metallic Mg in the presence of neutral salts, anions act catalytically, especially Cl. JOHN M. KANO

**Metallic catalysis in the pyrogenic decomposition of acetylene.** ERICH TIRDE AND WALDEMAR JERNISCH. Univ. Berlin. *Brennstoff Chem.* 2, 5-8(1921); cf. *C. A.* 6, 2618; 8, 342; 11, 2803; 13, 179, 1324.—Purified  $\text{C}_2\text{H}_2$  was passed through a heated Jena glass tube 40 cm. long by 1.4 cm. diam. containing the powdered catalyst in a porcelain boat. The temp. was 800° ( $\pm 1^\circ$ ) and the rate of gas flow 2-4 l. per hr. Oily and tarry products were sepd. from the exit gas by passage through a cooler, a washing-tower using paraffin oil (b. above 280°) and an electrostatic precipitator. The non-catalytic elements were found to be Al, Sb, Ph, B, Cd, Ca, Cr, Au, C, Mg, Mo, Hg (up to its b. p.), Ag, Si, Ta, Ti, U, Bi, W, Zn, Sn, Zr, and Pd and Pt in massive form; in these expts., as in the "blank," about 31% of the  $\text{C}_2\text{H}_2$  was converted to oil which was qualitatively the same in every case, and only 5-15% of paraffins, olefins and  $\text{H}_2$  was present in the exit gas. Li and Na absorbed the gas rapidly with formation of acetylides and  $\text{H}_2$ . The catalytic metals were Fe, Co, Ni, Cu, Mn, and Pd and Pt in finely divided form. In these cases the oil formation ranged from less than 1% (Fe) up to only .14% (Cu); no olefins were present in the gas, while the sum of the paraffins and  $\text{H}_2$  was in one case (Fe) as high as 99%. The temp. of first visible decompn. was much lower than before, in some cases beginning even at room temp. when the metal was finely divided. Alloys of Cu with Au, Cu with Zn, and Cu with Al were inactive, while an alloy of Cu with Ni was active. The catalytic effect is thought to be correlated with the soly. of  $\text{H}_2$  in the metals. W. B. VANARDEL

**Catalysis with platinum black.** II. E. OLIVERI-MANDALÀ. Univ. Palermo. *Gass. chim. ital.* 50, II, 81-9(1920).—Of the catalytic decompns. that Pt gives rise to in aq. soln. that of  $\text{H}_2\text{O}_2$  is best known. Some observations of O.-M. previously published (*C. A.* 11, 1608) on the decompn. of  $\text{HN}_3$  with Pt black cannot be explained by the generally accepted theories of  $\text{H}_2\text{O}_2$  catalysis. Traube's interpretation is expressed by the reactions:  $n\text{Pt} + y\text{H}_2\text{O}_2 \longrightarrow \text{Pt}_x\text{O}_y + y\text{H}_2\text{O}$ ;  $\text{Pt}_x\text{O}_y + y\text{H}_2\text{O}_2 \longrightarrow n\text{Pt} + y\text{H}_2\text{O} + y\text{O}_2$ . This cannot be extended to the reactions  $\text{NH}_4\text{NO}_3 \longrightarrow 2\text{H}_2\text{O} + \text{N}_2$ ;  $3\text{HN}_3 \longrightarrow 4\text{N}_2 + \text{NH}_3$ ;  $4\text{NH}_4\text{OH} \longrightarrow 2\text{NH}_3 + \text{N}_2\text{O} + 3\text{H}_2\text{O}$ ;  $2\text{NH}_4\text{NH}_2 \longrightarrow 2\text{NH}_3 + \text{N}_2 + \text{H}_2$ . If it is considered that  $\text{H}_2\text{O}$  also participates, the interpretation of

Traube may be generalized. Thus  $n\text{Pt} + m\text{H}_2\text{O} \rightarrow \text{Pt}_n\text{O}_m + m\text{H}_2$ . Or more particularly  $2\text{Pt} + 2\text{H}_2\text{O} \rightarrow 2\text{PtO} + 2\text{H}_2$ , then  $\text{N}_2\text{H}_4 + 2\text{PtO} \rightarrow \text{N}_2 + 2\text{H}_2\text{O} + 2\text{Pt}$  and  $\text{N}_2\text{H}_4 + 2\text{H}_2 \rightarrow 2\text{NH}_3 + \text{H}_2$ , from which  $2\text{N}_2\text{H}_4 \rightarrow 2\text{NH}_3 + \text{N}_2 + \text{H}_2$  as

given above. The symbol PtO may in reality stand for  $\text{Pt}(\text{OH})_2$ ,  $\text{Pt} \begin{array}{c} \diagup \text{O} \diagdown \\ \diagdown \text{O} \diagup \end{array}$  or  $\text{Pt} \begin{array}{c} \diagup \text{O} \diagdown \\ | \text{O} | \end{array}$

The above equations are written as though the oxidation and reduction stages take place with equal velocity. As a matter of fact the reduction may be twice as fast, thus  $2\text{N}_2\text{H}_4 + 2\text{H}_2 \rightarrow 4\text{NH}_3$  and the final reaction  $3\text{N}_2\text{H}_4\text{N}_2 \rightarrow + 4\text{NH}_3$ . The results of decompn. in alk. soln. give  $3\text{N}_2\text{H}_4 \rightarrow 2\text{N}_2 + 2\text{NH}_3 + 3\text{H}_2$ , which may be obtained by assuming that the oxidation is twice as fast as the reduction in the above set of equations. With  $\text{NH}_2\text{OH}$  the reactions are  $2\text{Pt} + 2\text{H}_2\text{O} \rightarrow 2\text{PtO} + 2\text{H}_2$  then  $2\text{PtO} + 2\text{NH}_2\text{OH} \rightarrow \text{N}_2\text{O} + 3\text{H}_2\text{O} + 2\text{Pt}$  and  $2\text{NH}_2\text{OH} + 2\text{H}_2 \rightarrow 2\text{NH}_3 + 2\text{H}_2\text{O}$ , from which  $4\text{NH}_2\text{OH} \rightarrow \text{N}_2\text{O} + 2\text{NH}_3 + 3\text{H}_2\text{O}$ . Tanatar (*Z. physik., Chem.* 40, 475; 42, 37(1902)) on the basis of an hypothesis of Engler and Wöhler considered that the Pt acts as an acceptor of O by which the base is reduced to  $\text{NH}_3$ ; the Pt oxide oxidizes  $\text{NH}_2\text{OH}$  and the cycle is repeated. O.-M. made quant. detns. of the velocity of decompn. of  $\text{NH}_2\text{OH}$  with 2 specimens of Pt black and obtained a fairly good const. for the 1st order reaction, from which it appears that the catalytic decompn. of  $\text{NH}_2\text{OH}$  is due to a number of simple reactions. Many more expts. on the decompn. of  $\text{HN}_3$  were done in order to see if other products than  $\text{N}_2$  and  $\text{NH}_3$  could be obtained. In this case the oxidation and reduction reactions are  $\text{HN}_3 + \text{H}_2 \rightarrow \text{NH}_3 + \text{N}_2$  and  $2\text{HN}_3 + \text{O} \rightarrow 3\text{N}_2 + \text{H}_2\text{O}$ . Vondráček (*Z. anorg. Chem.* 39, 24(1904)) represented the decompn. of  $\text{NH}_4\text{NO}_3$  thus:  $2\text{NH}_4\text{NO}_3 + x\text{PtO}_2 + y\text{H}_2\text{O} \rightarrow \text{N}_2 + 2\text{HNO}_3 + x\text{Pt} + (y + 3)\text{H}_2\text{O}$  and  $2\text{HNO}_3 + x\text{Pt} \rightarrow \text{N}_2 + \text{H}_2\text{O} + x\text{PtO}_2$ . This interpretation seems little intelligible to O.-M., who considers that first  $\text{NH}_4\text{NO}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4\text{OH} + \text{HNO}_3$  and that  $2\text{NH}_3 + 3\text{O} \rightarrow \text{N}_2 + 3\text{H}_2\text{O}$ . E. J. WITZEMANN

**Thermodynamic treatment of concentrated solutions, and applications to thallium amalgams.** GILBERT N. LEWIS AND MERLE RANDALL. Univ. Cal. *J. Am. Chem. Soc.* 43, 233-54(1921).—The exact thermodynamic treatment of concd. solns. may be illustrated by use of the data of Richards and Daniels on e. m. f. and thermal properties of Tl amalgams (*C. A.* 13, 3058), and of Hildebrand and Eastman on the v. p. of Hg from such amalgams at 325° (*C. A.* 9, 3125). Two methods of detg. the partial molal quantities, specifically the partial molal heat capacities, are described: (1) by the aid of "apparent molal quantities," and (2) by a method of intercepts consisting in plotting the molal value against the mol. fraction and drawing a tangent so that the intercept upon the ordinate of mol. fraction  $N = 1$  will be equal to the partial molal value. By such methods the partial molal heat content of Tl in various amalgams is calcd., the heat content of Hg and of an infinitely dil. Tl amalgam being assumed as zero, and from these values is obtained the partial molal heat content of Hg in more concd. amalgams by  $\int dL_{H_2} = -\int (N_{\text{Tl}}/N_{\text{H}_2}) dL_{\text{Tl}}$ , where  $N$  refers to mol. fraction. The heat of soln. of 1 mol. Tl in an infinite amt. of Hg is found to be 730  $\pm$  20 cal. Similar calcs. including the change of heat of transfer with temp. are used to calc. the heat of fusion of Tl, 1450 cal. The activities, defined by  $dF = RT d \ln a$ , where  $dF$  is the change in free energy per mol., and by  $\int d \log (a_1/N_1) = \int (N_2/N_1) d \log (a_2/N_2)$ , are given for various amalgams at 20 and 325° as detd. by 2 independent methods—the e. m. f. of concn. cells and v. p. measurements at 325°. The effect of temp. upon abnormality of solns. is discussed and it is shown that the v. p. at 325° can be calcd. from the e. m. f. at 20° by 2 methods between the values of which the true value must lie. G. L. CLARK

**Metallographic investigation of the system bismuth sulfide-antimony sulfide** YOSUO TAKAHOSHI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 47-50(1919).—T. detd.

by the cooling curve method the thermal equil. diagram for the system  $\text{BiS}-\text{Sb}_2\text{S}_3$ . His results do not confirm the findings of previous workers (*Compt. rend.* 137, 920-2 (1903)). *Conclusions.* (1)  $\text{Sb}_2\text{S}_3$  and  $\text{BiS}$  form with each other a continuous series of solid solus. (2)  $\text{BiS}$  dissociates at its m. p. to the extent of 1.5% into  $\text{Bi}$  and  $\text{S}$ . The freezing of this dissociated  $\text{Bi}$  caused a slight evolution of heat at temps. as low as  $264^\circ$ .

P. F. FLAGG

**Metallographic investigation of the system antimony sulfide-silver sulfide.** KOSUKU KONNO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 51-4 (1919).—K. takes cooling curves from 2-cc. samples of mixts. of the 2 compds. varying  $\text{Ag}_2\text{S}$  from 0 to 100% and gives the thermal equil. diagram. *Conclusions.* (1) In the system  $\text{Ag}_2\text{S}-\text{Sb}_2\text{S}_3$ , only one compd.,  $\text{Ag}_2\text{S}\cdot\text{Sb}_2\text{S}_3$  (42.41%  $\text{Ag}_2\text{S}$ ), is formed whose compn. corresponds to the mineral miargyrite. (2) There are 2 eutectics:  $\text{Sb}_2\text{S}_3$  with the compd. solidifies at 22%  $\text{Ag}_2\text{S}$  and  $482^\circ\text{C}$ .;  $\text{Ag}_2\text{S}$  with the compound solidifies at 72%  $\text{Ag}_2\text{S}$  and  $464^\circ\text{C}$ .  $\text{Ag}_2\text{S}\cdot\text{Sb}_2\text{S}_3$  forms no solid soln. with either  $\text{Ag}_2\text{S}$  or  $\text{Sb}_2\text{S}_3$ .

P. F. FLAGG

A compilation of named effects and laws. L. C. KRUEGER and H. R. HOSMER. *Gen. Elec. Rev.* 24, 258-78 (1921).—A convenient and useful list of the named laws and effects which are most frequently found in scientific reading. Brief definitions or equations are included.

C. G. F.

Electrical phenomena occurring at high levels in the atmosphere. S. CHAPMAN. *J. Inst. Elec. Eng. (London)* 57, 209-22 (1920).

C. G. F.

Dyeing wood by means of dispersoid silver. P. P. VON WEIDMARN. *Ann. école mines Oural* 1, part 2, 3-5 (1919).—Wood may be colored a variety of pretty shades by immersing it successively in liquids which interact to produce colloidal  $\text{Ag}$ , or by exposing it to the light after causing a  $\text{Ag}$  salt ( $\text{AgBr}$ ) to deposit in its fibers. The shades differ with the concns. of  $\text{Ag}$  and the methods of operation. The colors are very permanent.

H. M. GORDIN

Heat of combustion and heat of formation of calcium cyanamide (KAMEYAMA) 6.

ASHFORD, C. E.: *Electricity and Magnetism: Theoretical and Practical*. 3rd Ed. London: EDWARD ARNOLD. 303 pp. 4s. 6d. For review see *Nature* 106, 564 (1920).

FÜRTH, R.: *Schwankungserscheinungen in der Physik*. Braunschweig: Friedrich Vieweg & Sohn. 93 pp. M. 4.50 + Teuerungszuschlag. For review see *Z. physik. Chem.* 96, 502 (1920).

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

**Radioactive facts and nuclear structure.** GERHARD KIRSCH. Upsala. *Physik Z.* 22, 20-3 (1921); cf. *C. A.* 14, 3546.—A radioactive nucleus contains an  $\alpha$  particle at the center surrounded by alternating rings or shells of electrons and  $\alpha$  particles. The no. of electrons in the rings increases in the order 2, 4, 6, 8, etc. The first  $\alpha$ -ring is the source of the  $\alpha$ -rays. This model is applied to the  $\text{Th}$  series. The emitting  $\alpha$  ring is supposed still to contain 5  $\alpha$ -particles in  $\text{RdTh}$  and 2 in  $\text{Th A}$ . After  $\text{Th A}$  emits one of the  $\alpha$ -particles in this ring, the other goes to the center and joins the other  $\alpha$ -particle already there. This leaves 2 electron rings together and the next change is a  $\beta$  disintegration. The second  $\alpha$  particle at the center now finds itself *de trop* and leaves after the first  $\beta$  change, or at least after the second, with max. velocity ( $\text{ThC.ThC'}$ ). The nucleus has now returned to a condition roughly similar to its state at the beginning of the disintegration of  $\text{RdTh}$ , and this explains the stability of the end product



when the relative stability of  $RdTh$  is considered. Similar views are applied to the  $Ra$  and  $Act$  series, in which the central  $\alpha$ -particle is replaced by  $2H$  particles and one  $H$  or  $X_3$  particle, resp. All radioactive atoms are supposed capable of both  $\alpha$  and  $\beta$  disintegration, but the alternating structure of the nucleus always makes one type much the more probable, and the minority change is usually masked. The condensed charges in the nucleus are likened to a liquid or solid state of electricity. NORMAN F. HALL.

The proportion of the actinium branch in the uranium-radium family. ADOLF SMERKAL. *Physik Z.* 22, 48-51(1921).—S. assumes that one of the two different " $\alpha$ -particles" emitted by  $U_{92}$  is really an  $X_3$  particle. The simplest guess is that the  $U_{92}$  nucleus consists of 57  $\alpha$ -particles and  $2X_3$  particles. If mere chance decides which shall be expelled, 3.4% of the  $U_{92}$  atoms will emit  $X_3$  particles and the rest  $\alpha$ -particles. Recent detns. give 3-4.2% as the proportion of  $U_{92}$  atoms that form  $UY$ .  $RdAct$  may also disintegrate doubly in the same way and the new product (1.76%) have merely escaped observation. The ranges of the two sorts of " $\alpha$  particles" expelled by  $RdAct$  agree well with the hypothesis that the faster ones are  $X_3$  particles. NORMAN F. HALL.

Chemical action of penetrating radium rays. XII. The position of the fumaric-maleic acid equilibrium in the penetrating radium rays and on the action of the latter and of ultraviolet light upon aqueous solutions of urea, benzoic acid and formic acid. ARNON KAILAN. Inst. für Radiumforschung. *Monatsh.* 41, 305-17(1920); cf. C. A. 14, 1811.—There is a slight increase in the maleic acid content after the action of the penetrating radium rays upon a mixt. of the 2 acids. The point of equil. is probably about the same as is produced by the quartz Hg lamp (about 72% maleic acid). After 1632 hrs. the rays did not change the index of refraction nor the d. of an urea soln. By cond. expts. it was detd. that the  $NH_4CNO$  formed by the rays was  $0.69 \times 10^{-4}$ , while the blank contained  $0.87 \times 10^{-4}$ . The quartz Hg lamp decomps.  $HCO_2H$ , the g.-equiv. falling from 0.0998 to 0.0353 in 160 hrs. and to 0.0232 in an additional 47 hrs. The action of the radium rays is much less pronounced, 1632 hrs. decreasing this value from 0.1044 to 0.1017.  $BzOH$  yields about 3.5%  $HCO_2H$  after 22.5 hrs. action of the Hg lamp, and about 10% after 47 hrs. The rays active in the decompn. are shorter than  $0.34\mu$ . The fact that  $(CO_2H)$  is formed from  $C_7H_5$  indicates that it comes directly from the  $C_7H_5$  and not from  $BzOH$  as an intermediate product. By the action of radium rays for 2302 hrs. about 28%  $HCO_2H$  resulted. C. J. WESS.

Electrons. WM. BRAGG. *Electrician* 86, 125(1921); *Engineering* 111, 120-2(1921).—A report of the 12th Kelvin lecture. The fundamental work of Crookes, Millikan, O. W. Richardson, and others is first discussed. From the study of the X-Ray spectrum of the diamond, it is concluded that there are definite sub-centers of force on the outskirts of the atom and in the C atom there are 4 such centers arranged symmetrically, in tetrahedron fashion around the core. These are not oriented in exactly the same way. With reference to a tetrahedral plane, half the atoms point toward the plane and their neighbors away from it. Since crystalline structure is the basis of all solid structure, this minute study fundamentally concerns the strength of materials, their temper and all their physical properties. Already we know enough to be certain that an increase in our theoretical information will be closely followed by practical applications of which the Coolidge tube and the thermionic valve are but the forerunners. W. E. RUDEN.

Negative electron curve. S. G. BROWN. *Nature* 106, 342-3(1920).—The difference between a whole no. multiple of 1.008, representing the mass of the H nuclei in all atoms, and the true at. wt., which is smaller, may be accounted for by the negative effect of the negative electrons, which are repulsed by gravity. If these negative nos. are plotted against at. wts. from H to Ge a smooth curve is obtained. The elements Be, Ne, Mg, Si, Cl and A do not fall on the curve. B. is at a loss to account for this (and seems to have overlooked the possibility of isotopes.—Abstractor.) G. L. C.

The internal energy of the Lorentz electron. S. R. MULLER. Univ. Sheffield. *Phil. Mag.* 40, 494-9(1920).—It has long been recognized that the Lorentz electron is not a purely electromagnetic system. The non-electromagnetic energy is assumed to be located in the "nucleus" of the electron and has the value  $(1/6)(e^2/a)(1-\beta^2)^{3/2}$ , in which  $e$  is the charge on an electron,  $a$  is the major semi-axis of the nucleus and  $\beta$  is the velocity of the electron expressed as a fraction of the velocity of light. M. points out an additional reason for the assumption of this internal non-electromagnetic energy of the electron which arises in connection with the Poynting flux of energy in the field of a uniformly moving electron. M. shows that the amount of energy required to satisfy the new considerations takes the same formulation as that given above and also satisfies the mechanical and relativity theories.

S. C. LIND

Theory of radiometer action. I. Radiometer action in spheres. G. LASHI AND F. ZERNER. *Z. Physik* 3, 224-42(1920).—A theoretical discussion of the effect of light radiation on small spheres suspended in a gas. The resultant force is due partly to "light pressure" and partly to absorption and consequent heating. The final result, which is not in finite form and holds only for spheres large compared to the mean free path of the gas, is in accord with the results of expt. In particular it shows the independence of pressure, and the possibility of Ehrenhaft's negative photophoresis, i. e., motion of the particle toward the light instead of away from it. F. C. HOYR

X-rays: A brief sketch of their history, nature and technical applications. KERR GRANT. *Science and Ind.* (Australia) 2, 526-38(1920).

E. J. C.

Precision measurement in the L-series of X-rays. Elements tungsten to copper. EILIS HJALMAR. Lund. *Z. Physik* 3, 262-86(1920).—H. measures with an av. accuracy of 0.005% the wave lengths of the L-series lines for the elements from W to Cu. Sommerfeld's doublet relation is accurately fulfilled for elements of lower atomic number, but for those of higher atomic number the frequency difference of  $\beta_1$  and  $\alpha_1$  is a little greater than that for  $\gamma_1$  and  $\beta_1$ . If the effective nuclear charge, as in Sommerfeld's theory, is taken as  $(Z-s)$  where  $Z$  is the atomic number,  $s$  can be calcd. from the hydrogen type formula with the relativity correction, for the L doublet.  $Z$  is approx. const. and has a mean value of 3.5100. For the K doublet, which is equal to the frequency difference of  $L/\alpha_1$  and  $L/\alpha_2$ , the av. value of  $s$  is 12.993, and there seem to be no systematic deviations from constancy.

F. C. HOYR

Absorption limits of the L-series. A. SWEKAL. *Z. Physik* 3, 243-46(1920).—The failure of Hertz (*C. A.* 15, 206) to find more than three abs. limits in the L-Series of X-rays confirms S.'s opinion that Sommerfeld's A-doublet has no real existence.

F. C. HOYR

Spectrum lines and the modern theories of physics. P. ZHEMAN. *Scientia* 29, 13-22(1921).—This article outlines briefly, in popular language, the progress of spectroscopy from the time of Newton to the present. It is an excellent treatment for the general reader.

K. BURNS

Vacuum hot-spark spectrum of zinc in the extreme ultraviolet region. R. A. SAWYER. *Astrophys. J.* 52, 286-300(1920).—The spectrum of Zn was extended to wave lengths about  $\lambda 300 \text{ \AA}$ . The condensed spark served as source. Using sufficiently high potentials, this can be passed between electrodes one millimeter apart, even in vacuum. The source, a specially ruled grating, the slit and plate holder, with means of making necessary adjustments, were all mounted in a brass tube 1 m. long and 15 cm. in diam. This tube was kept evacuated by means of a diffusion pump. On account of the gas given off by the electrodes, a series of sparks lasting 5 sec. could be allowed only every 5 min. a total exposure of 20 or 30 min. was used. The precautions necessary to prevent fogging of the plate and to minimize the corrosion of the grating are described. It is of interest to note that the seals had to be free from S. The wave lengths of some 100 new lines, probably due to Zn, are tabulated, the ac-

curacy being about 0.5 Å. These lines are all of wave length less than  $\lambda 2200$  Å, 80 of them lie below  $\lambda 1400$  Å, the shortest being at  $\lambda 316$  Å.

K. BURNS

Revision of the series in the spectrum of calcium. F. A. SAUNDERS. *Astrophys. J.* 52, 265-77(1920); cf. *C. A.* 14, 1932.—Some fifty new lines, and more accurate detns. of known wave lengths, have been used in a study of the series in the Ca spectrum. This consists of three systems of series singlets, doublets and triplets, and combinations of these systems. In each system there are four types of lines. The present paper treats the singlets and triplets, and their combinations. There are no known combinations of the doublets with the others, which leads to the supposition that the doublets are associated with a different vibrating mechanism, perhaps  $\text{Ca}^+$ . It was found possible to extend most of the series, to calc. the limits with greater precision, and to identify various combination series. The diffuse series of triplets was extended to 15 terms and was shown to exhibit curious anomalies. Altogether, four triple-series of each system were found, and three possible inter-system combination series.

K. BURNS

Spectra of some compound gases in vacuum tubes. W. H. BAIR. *Astrophys. J.* 52, 301-16(1920).—This paper reports the results of a spectroscopic investigation of six compound gases, conducted in the Berkeley Physical Laboratory. The gases were  $\text{NH}_3$ ,  $\text{N}_2\text{O}$ ,  $\text{N}_2\text{O}_4$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{S}$  and  $\text{SO}_2$ . Discharge tubes of 4 to 6 mm. diam. and 15 to 20 cm. in length were connected with a pump and the flow of gas through these tubes was regulated by a valved capillary tube. The spectra were photographed in the region of wave length greater than  $\lambda 3800$  Å, by means of a three-prism glass spectrograph, while a quartz instrument was used to photograph the region  $\lambda 1850$  Å to  $\lambda 4000$  Å. The well known ammonia band in the visible was found to have two heads, both degraded in both directions. The behavior of this band is so different from that of the band at  $\lambda 3371$  Å that the latter is thought to be due to some other compd., but the results of the investigation were not conclusive on this point. Both oxides of N show strongly the third positive group of nitrogen bands, especially with the flowing gas. This group of bands was observed from  $\lambda 1902$  Å to  $\lambda 3458$  Å; those at the more refrangible end depart from Deslandres's law. Of the two negative groups of carbon bands, the first is probably due to CO and the second to  $\text{CO}_2$ . Several new bands were observed in this latter group. Forty new bands were found in the spectrum of  $\text{SO}_2$ , extending this group to  $\lambda 2124$  Å. The wave lengths of the new bands, and of some bands of unknown origin, are given in tables.

K. BURNS

Grating measurements in the long-wave spectrum. H. RUBENS. *Sitzb. preuss. Akad.* 1921, 8-27.—This paper reports a continuation of the investigation of the spectra of the Auer burner and the quartz mercury lamp in the region 25 to  $250\mu$ . (Rubens and Wood, *Sitz. preuss. Akad.*, 1910, 1112). The absorption spectrum of  $\text{H}_2\text{O}$  vapor is discussed from a theoretical viewpoint. In the present instance the app. employed was a mirror spectrometer of great light-gathering power. The dispersive element was a wire grating, the grating space being 0.4 mm., 1.0 mm., or 2.0 mm. The spectrum was detected by means of a very sensitive thermoelement. The first order of the grating was used, and the radiation of shorter wave length was eliminated by means of quartz and fluorite screens, and by selective reflection from quartz or rock salt. The coarsest grating showed no absorption bands, the grating of 1.0 mm. space showed four bands, and the fine grating further resolved these bands. In all, 24 bands were found in the region 19 to  $132\mu$  and these were compared with the theoretical positions of bands derived from the fine structure of the water vapor band at wave lengths  $6.26\mu$ . The observations were represented by the theory in a very satisfactory manner. Three absorption bands were found in the spectrum of the quartz mercury lamp, one of which might be attributed to water vapor. Considered as emission bands, two of the maxima

could be explained by the interaction of positively and negatively charged mercury atoms.

K. BURNS

**Photochemical reactions.** W. NERNST. *Physik. Z.* 21, 602-5(1920).—With the help of W. Noddack, N. has checked his former work with L. Pusch (*C. A.* 14, 351) verifying the Einstein law,  $Q = N h \nu$  for certain photo-brominations. Noddack has investigated the reaction  $\text{Cl} + \text{CCl}_3\text{Br} = \text{CCl}_3 + \text{Br}$  in light and finds that Einstein's law holds (its first experimental verification in solutions). Although the photochemical efficiency remains unchanged as the reaction proceeds, the addition of extra  $\text{CCl}_4$  slows down the reaction. This surprising phenomenon suggests to Nernst that the light does not produce Cl atoms, as formerly supposed, but activated  $\text{Cl}_2$  molecules, thus  $\text{Cl}_2 = \text{Cl}_2' - 70,000$  cals. This reaction is then followed by the splitting up into atoms,  $\text{Cl}_2' = 2 \text{Cl} - 30,000$ . The total heat of dissociation is approx. 100,000 calories. In the discussion following Stern criticizes the theory on the basis of the energy absorption required to dissociate  $\text{Cl}_2'$ . Nernst points out that many reactions which absorb large quantities of energy, have a high reaction rate. Trautz reports that he finds the heat of dissociation of  $\text{Cl}_2$  to be 60,000-70,000 calories. Stern's objection then becomes invalid.

FARRINGTON DANIELS

**Photocatalysis.** G. PLOTNIKOW. *Chem.-Ztg.* 44, 825-8(1920).—A chapter taken from Plotnikow's "Textbook of Photo-Chemistry," which has just been published (a book which will be welcomed by all interested in photochemistry). Every element or compd. which possesses a free valence electron is considered as photochemically unsatd. The photoactivity of elements is thus a periodic function of their atomic numbers. Every photochemically unsatd. compd. is photoactive. Light tends to convert an unsatd. system into a satd. one and energy may be absorbed or evolved. In general the longer rays influence the reactions accompanied by an energy loss and the shorter ones the reactions accompanied by an energy gain. Photochemical action is associated with free valence electrons which are found in the outer ring of the atom. An inactive system may be made photochemically active, or an active system may have its absorption range extended by adding an element rich in valence electrons, U, Fe, Cl, etc., to a photochemically unsatd. element or compd. Each catalyst has its own temp. coeff. and its own efficiency. Photochemical catalysis may be divided into (1) "contact" catalysis (not necessarily heterogeneous systems—Abstr.) where the catalyzer attaches itself loosely to the indifferent compd. The sensitizing of photographic plates through dyes. (2) "Transfer" catalysis where the reaction is split up by the foreign substance into a series of reactions which have a greater velocity. The oxidation of  $\text{H}_2\text{PO}_3$  in the presence of HI. (3) Chemical catalysis where the catalysts are not photo-sensitive and no new absorption lines are formed. Moisture in several reactions. (4) Optical catalysis in which the photoactive rays are absorbed thermally by the catalyst. The photocatalytic action of *chlorophyll* (contact catalysis) is described.

FARRINGTON DANIELS

**Ultraviolet rays for chemical reactions.** ANON. *Chem.-Ztg.* 44, 814(1920).—A compact app. for subjecting gases and liquids to the action of intense ultraviolet light has been put on the market. A mercury-vapor lamp of clear quartz is used. A photograph of the app. is given.

FARRINGTON DANIELS

Electrical phenomena occurring at high levels in the atmosphere (CHAPMAN) 2.

AICHI, KEI-ICHI: *Hosha-no Gairon* (Outline on Radioactivity). Tokyo: Maruzen Co. 208 pp. 3.50 yen. For review see *J. Orient. Sci. Arts* 37, 439(1920).

**Rendering liquids radioactive.** S. SAUBERMANN. *Can.* 209,050, Mar. 1, 1921. Aq. liquids are rendered radioactive by subjecting them to the action of an alkaline

earth metal salt which is more sol. in the liquid than is the Ra. salt having the same acid radical and which is not radioactive, then bringing the treated solvent into contact with the Ra. salt containing the same acid radical as the alkaline earth salt.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

Humphrey Davey. A. L. JORDAN. *J. Elec. West. Ind.* 46, 206(1921).—Brief biographical sketch. C. G. F.

First heat from naval electric furnace. ANON. *Iron Age* 107, 817-8(1921).—The two 40-ton Heroult furnaces at South Charleston, W. Va., are the largest in the world. Scrap and pig Fe are melted down in two 75-ton open-hearth furnaces, natural gas being used as fuel, and, after dephosphorizing, the metal is transferred to the elec. furnaces, where it is desulfurized, deoxidized, final additions are made and suitable temp. is obtained before casting. The elec. furnaces are tilting, of the 4-door Heroult type, basic-lined, and have steel shells with diam. (unlined) of 18 ft. and height of 8 ft. With the equipment provided it is possible to make ingots up to 175 tons in weight. The elec. furnaces operate on a 3-phase, 60-cycle circuit at 90 and 110 volts. Power is received through a 3300-kv. a. water-cooled transformer from a 6600-volt primary circuit. Normal demand of the furnaces is from 1500 to 3000 kw. each. C. G. F.

Developments in electric iron and steel furnaces. J. BIBBY. *J. Inst. Elec. Eng.* (London) 57, 231-46(1920).—See C. A. 14, 16. C. G. F.

Electric furnaces. F. W. HARBORD, et al. *J. Inst. Elec. Eng.* (London) 57, 276-305(1920).—A general discussion. See C. A. 13, 1672. C. G. F.

The electrometallurgy of French ferro-alloys. JEAN ESCARD. *Rev. electrochimie* 13, 133-41(1920).—A review. Cf. C. A. 14, 2755. F. H. H.

Electric furnaces in the iron foundry (duplexing). RICHARD MOLDENKE. *Iron Age* 107, 437-9(1921).—The grave problem of S accumulation, especially as result of high-scrap mixts. melted during the war, has its best soln. in the basic-hearth elec. furnace. This yields metal (1) with a high degree of superheat; (2) thoroughly deoxidized, and (3) reasonably low in S. Since melting cold scrap or pigs requires big current reserve and higher cost on account of fluctuations,  $\frac{1}{3}$  of current is saved by "duplexing," i. e., cupola-metal refining in the elec. furnace. When the product can be divided into high-grade (elec. refined) and ordinary work, the duplex process has only a reasonable cost— $\frac{1}{2}$  cent per lb. additional. Other advantages are easier control of P and Mn, and great saving in runners, gates and misrun castings due to intense heat and fluidity after elec. melting. Also in *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1044, 7pp.; *Foundry* 49, 216-8. F. H. HOTCHKISS

Operating records of electric furnaces refining high-grade steels. M. H. SCHMIDT. *Elec. World* 77, 605(1921).—S. gives av. figures for a yr.'s performance with an installation of two 15-ton and one 6-ton Heroult furnaces, all 3-phase, and two 1-ton single-phase Snyder furnaces. The Heroults require 568 kw. hrs. per ton for melting and refining cold scrap (6-ton size), and 168 kw. hrs. when charge is already molten (15-ton size). The electrode consumption is 26.6 lbs. per ton of steel. The Snyders take 1002 kw. hrs. to melt and refine cold metal; the electrode consumption is 41.4-lb. per ton. Better steel results from a high current for melting-down and just before tapping. F. H. HOTCHKISS

The electric blast furnace. MARCEL GUÉDRAS. *Tech. moderne* 12, 461-7.—See C. A. 14, 1508. F. H. H.

The manufacture of cast iron from pyrites cinders in the electric furnace. MARCEL GUÉDRAS. *Tech. moderne* 12, 301-4(1920).—Pyrites cinders from  $H_2SO_4$  manuf.

contain 94%  $\text{Fe}_2\text{O}_3$ , 8%  $\text{SiO}_2$ , and 2.75–3.5% S. This material is ideal for Fe-smelting except for the prohibitive S content. Owing to difficulties from large amt. of moisture (20–22%) held mechanically, economical desulfurization had not been effected previous to the Guédras-Duina patent. The G.-D. process combines (1) complete dehydration; (2) desulfurization; (3) agglomeration in a horizontal rotating furnace at 1000–1200°, and (4) reduction with coke, charcoal, or charcoal and anthracite in a Siemens-type elec. furnace. The first treatments can be made with lignite, about 300 kg. per ton. Without agglomeration the pyrites would go off in slag before reduction. The agglomerated lumps contain 0.1–0.2% S, and are easily permeable to gases. About 20,000 amps. are used at 50 v.; the power factor is about 60. The electrode consumption is 14 kg. per ton. The desulfurization is due partly to action of lime or mineral slags added, but mostly to introduction of proper amts. of  $\text{CaCl}_2$ . The probable reaction is:  $\text{FeS} + \text{CaCl}_2 + \text{CO} = \text{Fe} + \text{CaS} + \text{COCl}_2$ . The  $\text{COCl}_2$  then reacts with  $\text{FeS}$ , freeing S and thus keeping slag from satn. with  $\text{CaS}$ . The product is high-grade Fe (0.01–0.03% S), made at a saving of 124.5 francs per ton over blast-furnace Fe.

F. H. HOTCHKISS

Some thermal characteristics of electric ovens. E. GRIFFITHS AND F. H. SCROFIELD. *Electrician* 86, 222–4 (1921).

C. G. F.

The Booth-Hall electric furnace. W. K. BOOTH. *J. Inst. Elec. Eng.* (London) 57, 247–9 (1920).—See C. A. 13, 1672, 2636.

C. G. F.

Continuous electrode. OYSTEIN RAVNER. *Chimie & industrie* 4, 731–4 (1920).—A well illustrated description is given of the continuous self-baking electrode devised by Söderberg to eliminate the expense of prepn. (cf. Richards, C. A. 14, 247, 3018). A mixt. of calcined anthracite, coke, tar and rosin is packed into a cylindrical casing of sheet-Fe and is baked gradually by heat from the crater of the furnace. The casing (about 5% by wt.) not only improves the contact for current, but protects the electrode from hot gases, etc. Great success has followed its installation at Anniston, Ala., for ferro-Mn.

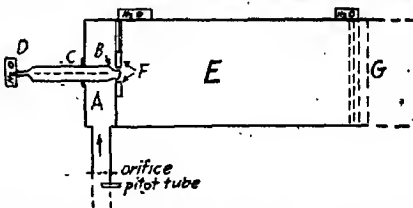
F. H. HOTCHKISS

Equipment of a hydrographic basin in the Pyrenees and utilization of the energy produced for the manufacture of cyanamide. BUREAU D'ORGANISATION ECONOMIQUE. *Rev. de l'ing.* 25, 23–35, 73–82 (1919).—The development and equipment of a large natural basin for hydroelec. power is described in detail. Local industries include a cyanamide factory and a complete, modern wood-distn. plant. Of interest is a 15,500-meter transmission line for 120,000 v. (18,000 kva.).

F. H. HOTCHKISS

Nitric acid production in the Island arc furnace. J. S. ISLAND. *Can. Chem. J.* 4, 323–5 (1920).—Production of N compds. from the air is limited by elec. power prices and facilities; many localities exist where these costs are lower than those of Chilean nitrate. Of all the types now in operation, the Island furnace best provides the 3 prerequisites for max.

yield: (1) Intimate mixing of air into arc; (2) rapid removal, and (3) rapid cooling of gases below 800°. Air is blown into a circular chamber; A, 3.5 in.  $\times$  18 in. diam., through which passes the shaft for a rotating electrode, B. This



shaft is double-shell and provides  $\text{H}_2\text{O}$  cooling for the brass electrode. Suitable insulation is afforded by a porcelain collar at C, and porcelain mountings for pump and water-tanks at D, the shaft being belt-driven from the blower motor. The aperture to the brick-lined reaction chamber E is through the center of a circular brass electrode,

F, also H<sub>2</sub>O-cooled. At the exit end is a series of H<sub>2</sub>O-cooled baffles, which bring the gases to about 250°. Insulation of the whole furnace is secured by resting on 3 layers of kieselguhr brick. The electrode points do not burn away, since the arc is blown out from the face of electrode; they are easily and cheaply replaceable. A voltage of 6000 is used for starting; it then drops to 800 v. with 80-85 amps. passing. The power factor is 87-90. The air flow was measured by Pitot-tube, orifice, and calorimetric methods, which checked well. Analysis of exit gases by volumetric and gravimetric means agreed closely, but results varied for no accountable reason, from 70 up to 100 g. HNO<sub>3</sub> per kw. hr. input. The higher yields are assured with conditions favorable. This yield is compared with the 61 g. HNO<sub>3</sub> per kw. hr. reported max. by the Nitrogen Products Committee.

F. H. HOTCHKISS

Marsh electrolytic cell for chlorine and caustic soda. CLARENCE W. MARSH. *Chem. Age* (N. Y.) 29, 10(1921); *Can. Chem. Met.* 5, 49-50(1921).—The Marsh electrolytic cell consists of the reinforced concrete top with downward extended ends, the anodes suspended from the top, the cathodes with the paper diaphragm applied to it, and the usual accessories and connections for Cl, brine and elec. current. The anodes, made of round graphite, are arranged into several superimposed horizontal elements. This arrangement of the anodes permits the use of corrugated sheet-steel cathodes, giving a max. active cathode surface. Also by this arrangement the Cl liberated at the anode is deflected from the path of the elec. current, thus eliminating polarization, and, therefore, cutting down power consumption. Comparative figures are given showing the saving of the Marsh cell over the types in use at present. D. I. GLANZ

Electrode reactions. Effect of temperature and depolarization on the type of nickel deposit obtained. HANS STÄGER. *Helvetica Chim. Acta* 3, 584-613(1920).—In general the type of deposit obtained at the cathode depends upon the metal and upon the electrolyte. Kohlschuetter and Vuilleumier (*C. A.* 13, 1050) attributed the brittle nature of heavy Ni deposits to a "sintering" process and made exact measurements of the actual contraction taking place. It was also assumed that H gas adsorbed or otherwise bound to the Ni was accountable for the phenomenon of brittleness. S. continues the investigation and uses the same app. as K. and V. had. The Pt cathode was 6.5 cm. × 2 cm. The vane or indicator fastened to the cathode was 30 cm. long; scale readings down to 0.1 mm. could be accurately made. For details of this contractometer see K. and V. (*loc. cit.*). In the sulfate baths a Pt anode was used; in the other baths, a Ni anode. (a) Expts. with 0.25 N NiCl<sub>2</sub>, 0.02 N HCl: current density 5 milliamper. per sq. cm. The deposits at 50° and 70° were decidedly more cryst. and showed less tendency to contract or peel. Expts. with 0.25 N NiCl<sub>2</sub>, 0.1 N CH<sub>3</sub>COOH; N NiCl<sub>2</sub>, 0.5% H<sub>2</sub>BO<sub>3</sub>; N NiCl<sub>2</sub>, N NH<sub>4</sub>Cl gave similar results. The higher the temp. the less the tendency to develop a H gas film. Addition of depolarizers, such as H<sub>2</sub>O<sub>2</sub>, C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub>, KClO<sub>4</sub>, brought about a reduction of the contraction tendency, as was to be expected. The addition of an unsatd. org. compd., such as C<sub>6</sub>H<sub>5</sub>(CH)<sub>2</sub>COONa, likewise caused a decided decrease in the "contraction coeff." of the Ni deposit. Superimposing a c. (40 cycles) had a marked beneficial effect: the deposits were bright, shiny and well adherent; the peeling tendency had been greatly reduced; the deposits were somewhat denser in SO<sub>4</sub> electrolytes than in chloride electrolytes; best ratio of d. c. to a. c. amps., about 1:1; solid smooth deposits, 0.12 g. per sq. cm. All of the d. c. + a. c. deposits were comparatively coarser-grained. They were more insol. in HNO<sub>3</sub> than the ordinary d. c. deposits; they were more insol. in HCl than rolled Ni and ordinary d. c. Ni. Many curves and tables are included.

C. G. F.

Cause of the spontaneous change in structure of nickel deposits. V. KOHLSCHUETTER. *Helvetica Chim. Acta* 3, 614-20(1920).—Polemical. A reply to Podzins (*C. A.* 13, 2040). Numerous references are cited in support of the assumption that a "sintering" takes place even at room temp. (See abstract above.) There seems to be little

doubt that the contraction of the Ni deposits is due to recrystn. and not mere coagulation. C. G. F.

**Electrical expression of human emotion.** A. D. WALLER. *Electrician* 86, 202 (1921).—Two Zn disk electrodes covered with chamois leather impregnated with NaCl soln. were fastened to the hand of the subject and coupled in series with a few dry cells and a galvanometer, so as to form one arm of a Wheatstone bridge. In response to certain emotions the galvanometer showed a decrease in elec. resistance of the circuit. W. concludes that the emotional response depends upon the dilation of the membranes through which the ions pass in general vital activity. When the nerve impulse reaches the membrane, the protoplasm contract, and the pores become dilated so that more ions can pass and more carriers of the current enter into action. Any discharge of the nerve system gives rise to galvanic phenomena. The resistance decrease may at times reach 4000 ohms. C. G. FINK

**The sparking voltages between spherical electrodes.** ALEXANDER RUSSELL. *J. Inst. Elec. Eng. (London)* 57, 223-30 (1920). C. G. F.

**Mineral conservation by electricity (Cottrell process).** G. B. ROSENBLATT. *J. Elec. West. Ind.* 46, 65-6 (1921).—A brief illustrated account of the modern elec. dust-recovery process in steel mills, cement factories, copper smelters, detinning plants, etc. C. G. F.

**The development of magnetic materials.** T. D. YENSEN. *Elec. J.* 18, 93-6 (1921).—At the beginning of elec. manuf., Swedish Fe was considered the best for magnetic circuits. This was replaced by the cheaper open-hearth products, which had a max. permeability of 2-3000 and a hysteresis loss of 3-5000 ergs per cc. per cycle for  $B = 10,000$ . "Lohys" steel was then developed but still had losses of about 3.56 watts per lb. at 60 cycles and 10,000  $B$ . The greatest development was made by Hadfield about 1900. He found that the addition of 1-5% Si or Al to iron decreases the hysteresis, increases the resistivity, and eliminate aging. Large elec. mfrs. have developed the material to a point where at present the loss is less than half what it was when the alloy was first produced by Hadfield. Expts. made on vacuum-treated pure alloys show a possibility of even greater reductions of losses by refined methods. The development of permanent-magnet steels also is briefly outlined by Y. The greatest improvement in this line is a 35% Co steel containing 7-9% Mo or W and 0.5% C described by Honda. W. E. RUDER

**Recent researches on the tungsten-filament lamp.** MARCHAND. *Industrie Elec.* 29, 472-3 (1920).—The major portion of this review is devoted to the subject of "getters." C. G. F.

**The preparation of calcium cyanamide (KAMEYAMA) 6. Production of potassium perchlorate (BLAU, WEINGAND) 18. Electrical phenomena occurring at high levels in the atmosphere (CHAPMAN) 2.**

MATSUI, MOTO-OKI: Yuki Denki Kwagaku (Organic Electrochemistry). Tokyo: Shōkwa-bō. VII — 147 pp. 1.90 yen.

**Operation of electric continuous-flow furnace.** WM. D. FLERT. *Can.* 209,852, Mar. 29, 1921. The heating effect of the elec. current is diffused through the ore body in a furnace by projecting a stream of gas from beneath the electrodes into the path of the current.

**Steel.** J. McCONNELL. *Brit.* 154,659, July 30, 1919. The charge from a converter, or open-hearth furnace, is finished in an elec. furnace, and alloying additions are made during the pouring of the product into the elec. furnace. The charge is run from the converter into a large ladle located beneath movable electrodes and provided with a



movable cover, to which the electrodes may be secured. The electrodes may be introduced into the charge after pouring; or they may be introduced first and gradually withdrawn during the pouring. The alloying additions, such as ferro-chrome, are supplied from a container in a cold and powdered state, and contact with the stream of molten metal while it is falling freely and unsupported. If it be desired to remove traces of S in the elec. furnace, CaO, fluorspar, and CaCl<sub>2</sub> may be added to increase the fluidity of the slag. Cf. C. A. 14, 44.

**Cyanides and cyanamides.** C. T. THORSSELL and H. L. R. LUNDEN. Brit. 154,896, Nov. 12, 1920. In the fixation of N as cyanides or cyanamides of alkali or alk.-earth metals by the reaction of N on mixts. of alkali or alk.-earth metal compds. and C, the materials, which may be briqueted, are introduced into the furnace in a dry condition, that is containing not more than 2.5% of H<sub>2</sub>O, so as to be of sufficient elec. cond. to avoid the production of arcs. When a shaft furnace is employed, the dry condition of the charge prevents the blocking of the furnace by the formation of lumps.

**Zirconium.** W. NORTH and H. LOOSLI. Brit. 155,299, Dec. 15, 1920. Zr ore or oxide is reduced by mixing it with the theoretical amt. of C and heating the mixt. under increased pressure in an elec. furnace. The current may pass through the charge itself, or a conductive C core may be used.

**Deposition of metals in non-adherent form.** M. A. ADAM, J. STEVENSON, A. T. MABBITT and J. FIELDHOUSE. Brit. 154,635, Feb. 27, 1919. See U. S. 1,365,140 (C. A. 15, 807).

**Apparatus for electrolyzing salt solutions.** T. MATSUSHIMA. U. S. 1,368,955, Feb. 15. The app. comprizes an outer tank with an unobstructed lower portion containing a NaCl soln., an inner tank holding NaOH soln. and having a pervious impermeate bottom spaced from the bottom of the outer tank, a thin layer of Hg on the previous bottom of the inner tank and a cathode pole extending through the NaOH soln. and into elec. contact with the layer of Hg.

**Apparatus for "electrocyanid" chlorination of ores.** R. T. SILL. U. S. 1,368,362, Feb. 15.

**Cleaning and plating apparatus.** GEO. W. SCHWEINSBERG. Can. 209,786, Mar. 22, 1921. The app. is for prep. and plating articles in continuous sequence without intermediate handling. It comprizes means for carrying articles along tracks through cleaning and plating tanks and means for washing and draining the articles between the tanks.

**Galvanic batteries.** D. PEPPER. Brit. 154,590, Nov. 27, 1920. A cell consists of a container of Pb-Sb alloy containing between 3 and 6% Sb, and an absorbent and expansible jar of molded wood pulp, blotting paper or similar material. The intermediate space is filled with PbO<sub>2</sub>, the expansible jar containing H<sub>2</sub>SO<sub>4</sub> and a pasted Pb grid bent into a suitable form. The expansible jar is filled with absorbent material similar to that of which the jar is composed and it may be provided with a flanged opening in the bottom. The cell is closed by a layer of sawdust and an asphalt seal.

**Preserving dry-cell electric batteries.** W. S. BROWN. U. S. 1,368,470, Feb. 15. Battery cells are sealed with shellac and when the shellac coating is but partially dry a protective coating such as asphalt is applied over the shellac to prevent access of air.

**Storage battery.** P. M. MARKO. U. S. 1,368,817, Feb. 15. Structural features.

**Casting storage-battery grids.** J. B. LITTLE. U. S. 1,368,445, Feb. 15. Mechanical features.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

The preparation of calcium cyanamide. NAOTO KAMEYAMA. *J. Coll. Eng. Tokyo Imp. Univ.* 10, 173-207 (1920).—The prepn. of pure  $\text{CaCN}_2$  was undertaken because it was wanted as a starting material for investigations of the reactions taking place in the lime-nitrogen furnace, and for researches on the technical uses of lime-nitrogen. The formation of  $\text{CaCN}_2$  by igniting together urea and  $\text{CaO}$  was studied first. Below  $300^\circ$  no  $\text{CaCN}_2$  is produced by this reaction; the product is  $\text{Ca}(\text{CNO})_2$ :  $2\text{CO}(\text{NH}_2)_2 + \text{CaO} = \text{Ca}(\text{CNO})_2 + 2\text{NH}_3 + \text{H}_2\text{O}$ . At  $300^\circ$ , 60 min. heating yielded a trace of  $\text{CaCN}_2$ , but 30 min. heating gave only  $\text{Ca}(\text{CNO})_2$ . Between  $340^\circ$  and  $380^\circ$  no  $\text{Ca}(\text{CNO})_2$  was found in the product, the  $\text{Ca}(\text{CNO})_2$  having been converted by  $\text{CaO}$  completely, but slowly, into  $\text{CaCN}_2$ :  $\text{Ca}(\text{CNO})_2 + \text{CaO} = \text{CaCN}_2 + \text{CaCO}_3$ . At  $450^\circ$  this change is more rapid. Therefore, at higher temps., the formation of  $\text{CaCN}_2$  from  $\text{CO}(\text{NH}_2)_2$  and  $\text{CaO}$  passes through the intermediate stage of cyanate. To prep.  $\text{CaCN}_2$  by this method it is advisable to heat for a short time and at a high temp. in order to minimize the loss of  $\text{CaCN}_2$  by oxidation by the air. About 5-7 min. heating at  $800^\circ$  suffices to convert into  $\text{CaCN}_2$  all  $\text{Ca}(\text{CNO})_2$  formed as an intermediate. The percentage yield of  $\text{CaCN}_2$  depends upon the relative proportions of  $\text{CaO}$  and urea used. Mixts. containing 2, 1.5, and 1 parts of  $\text{CaO}$  for 1 of urea, when suitably heated, give products containing, resp., about 16.5, 24 and 34% of  $\text{CaCN}_2$ . The best yield in air is 92-98% of the theoretical, but if the heating is in a current of N the transformation of urea is quant. However, even with the theoretical yield, 1 mol. of  $\text{CaCN}_2$  is accompanied by 2 mols. of  $\text{CaCO}_3$  or its decompn. product, and the content of  $\text{CaCN}_2$  is too low for a prepn. of high purity. Inasmuch as the heating of  $\text{Ca}(\text{CNO})_2$  gives  $\text{CaCN}_2$ , an attempt was made to prep. pure  $\text{Ca}(\text{CNO})_2$ . Five cc. of a soln. containing 2 g. of  $\text{KCNO}$  was mixed with 5 cc. of a soln. containing 2 g. of  $\text{Ca}(\text{OAc})_2$  and abs. alc. was added. A gelatinous ppt. was formed which contained an abundance of Ca, but no cyanate. By using some of the material obtained by heating together urea and  $\text{CaO}$ ,  $\text{Ca}(\text{CNO})_2$  was shown to be much less sol. in alc. than in  $\text{H}_2\text{O}$ , and the addition of alc. to an aq. soln. of  $\text{Ca}(\text{CNO})_2$  produced a gelatinous ppt., but this ppt. could not be identified as  $\text{Ca}(\text{CNO})_2$ . The prepn. of  $\text{CaCN}_2$  by heating a mixt. of dicyanodiamide and  $\text{CaO}$  was next studied:  $3(\text{CN}_2\text{H}_2)_2 + 6\text{CaO} = 4\text{CaCN}_2 + 2\text{CaCO}_3 + 4\text{NH}_3$ . The formation of  $\text{Ca}(\text{CNO})_2$  as an intermediate product in this reaction could not be detected, even at as low a temp. as  $300-400^\circ$ . At  $320^\circ$  some  $\text{CaCN}_2$  is formed, but it is advisable to ignite at  $900-1000^\circ$  in order that the amt. of  $\text{CaCO}_3$  accompanying the  $\text{CaCN}_2$  may be less, and for a short duration, say 10 min. Thus, by using 1 part of  $\text{CaO}$  and 1 part of  $(\text{CN}_2\text{H}_2)_2$ , a product will be obtained containing about 50-53%  $\text{CaCN}_2$ , and less than 3%  $\text{CaCO}_3$ , the rest being  $\text{CaO}$ . The  $\text{CaCN}_2$  may be enriched up to 88-93% by igniting this product twice more with an excess,  $1/2$  part, of  $(\text{CN}_2\text{H}_2)_2$ . It may be enriched further by heating twice more with an excess of  $(\text{CN}_2\text{H}_2)_2$  in a current of N. The author obtained in this way a product containing 99.33%  $\text{CaCN}_2$ , the rest being  $\text{CaO}$ .

R. H. LOMBARD

Studies on calcium cyanamide. NAOTO KAMEYAMA. *J. Coll. Eng. Tokyo Imp. Univ.* 10, 209-47 (1920).—The action of  $\text{O}_2$ ,  $\text{CO}_2$ , and  $\text{CO}$  upon  $\text{CaCN}_2$  was studied by heating in a tube furnace and then noting the change in gas pressure, analyzing the residual gas, and detg. the  $\text{CaCN}_2$ ,  $\text{CaCO}_3$  and  $\text{CaO}$  in the charge after heating. The  $\text{CaCN}_2$  used contained 92-93%  $\text{CaCN}_2$ , 3-4%  $\text{CaCO}_3$  and 2-4%  $\text{CaO}$ .  $\text{O}_2$  begins to act upon  $\text{CaCN}_2$  at  $420^\circ$  and the reaction proceeds with appreciable velocity at  $450^\circ$ . Some variation of the  $\text{O}_2$  concn. does not appreciably influence this temp. The reaction follows the equation:  $\text{CaCN}_2 + 3/2\text{O}_2 = \text{CaCO}_3 + \text{N}_2$ . There was no sepn. of C in the charge even at  $420^\circ$ . At higher temps.,  $840-900^\circ$ , the products of decompn. of

$\text{CaCO}_3$  are found, and the reaction proceeds partly as  $\text{CaCN}_2 + 3/2 \text{O}_2 = \text{CaO} + \text{CO}_2 + \text{N}_2$ . The action of  $\text{CO}_2$  upon  $\text{CaCN}_2$  was studied between  $700^\circ$  and  $1140^\circ$ . Up to  $1070^\circ$  decompn. was not accompanied by the sepn. of C. The solid reaction product was  $\text{CaCO}_3$  below  $840^\circ$ , and  $\text{CaO}$  at higher temps.  $\text{CO}$  and  $\text{N}_2$  were always produced, the vol. ratio  $\text{CO}/\text{N}_2$  being greater than 2 and usually about 2.3 in the gas collected for analysis. Therefore, up to  $1070^\circ$ , it is assumed that the reaction follows the equation,  $\text{CaCN}_2 + 2 \text{CO}_2 = \text{CaO} + 3 \text{CO} + \text{N}_2$ . At  $1110^\circ$  or higher the reaction is very rapid. In an expt. where the  $\text{CaCN}_2$  was heated  $1\frac{1}{2}$  hr., the ratio  $\text{CO}/\text{N}_2$  reached a max. and then decreased rapidly, and there was sepn. of C in the mass of the charge. This seems to be due to the action of  $\text{CO}$  produced and accumulated in the latter part of the expt.:  $\text{CaCN}_2 + \text{CO} = \text{CaO} + 2 \text{C} + \text{N}_2$ . The sepn. of C at or below  $1000^\circ$  observed by Caro might have been due not to the direct action of  $\text{CO}_2$ , but perhaps to the decompn. of  $\text{CO}$  produced from  $\text{CO}_2$  by the reaction,  $\text{CO}_2 + \text{C} = 2 \text{CO}$ , this reaction having been catalyzed by  $\text{Fe}_2\text{O}_3$ , etc., present in the technical lime-nitrogen. Regarding the reaction between  $\text{CO}$  and  $\text{CaCN}_2$ , no direct action was observed up to  $1000^\circ$  in the absence of a catalyzer; but in some cases the reaction  $2 \text{CO} = \text{C} + \text{CO}_2$  was catalyzed by the unglazed porcelain surface of the furnace tube, and then the cyanamide was oxidized indirectly by the  $\text{CO}_2$ . In such cases C was deposited on the porcelain tube, but none in the mass of the  $\text{CaCN}_2$ . At temps. of  $1140^\circ$  or higher,  $\text{CO}$ , if not in exceedingly small concn., decomposes  $\text{CaCN}_2$  directly according to the equation  $\text{CaCN}_2 + \text{CO} = \text{CaO} + 2 \text{C} + \text{N}_2$ , even in the absence of catalyzers. The temp. at which this direct action of  $\text{CO}$  becomes brisk is not very far from  $1020^\circ$ . The author does not wish to assert that  $\text{CaCN}_2$  in contact with  $\text{CO}$  containing 6-16% N at nearly atm. pressure is in a stable condition at  $1000^\circ$  or lower. It is possible that in the presence of suitable catalyzers the  $\text{CaCN}_2$  is decompd. directly by  $\text{CO}$  at these temps. R. H. L.

**Heat of combustion and heat of formation of calcium cyanamide:** NAOTO KAMEYAMA. *J. Coll. Eng. Tokyo Imp. Univ.* 10, 249-63 (1920).—The heat of combustion of  $\text{CaCN}_2$  was measured in a calorimeter bomb of the Hempel type. The  $\text{CaCN}_2$  used contained about 94%  $\text{CaCN}_2$ . Because the  $\text{CaCN}_2$  could not be ignited by the hot iron wire of the calorimeter, pure cane sugar was mixed with it in order to combust it. In the first 3 results below 1 part of  $\text{CaCN}_2$  and 2 parts of sugar were used, but in this case the heat from the  $\text{CaCN}_2$  was only 18% of the total heat. Therefore, in order to increase the accuracy of the result, in the last 2 measurements, 1 part of  $\text{CaCN}_2$  to 1 part of sugar was used. The 5 values of the heat of combustion of 1 g. of pure  $\text{CaCN}_2$  obtained are, 1961, 1881, 1932, 1935 and 1936 cal. The mean of the last two values was chosen as the best value, namely, 1935 cal./g. For 1 g.-mol. of  $\text{CaCN}_2$ , at const. vol.,  $\text{CaCN}_2 + 3/2 \text{O}_2 = \text{CaO} + \text{CO}_2 + \text{N}_2 + 155,020$  cal., and at const. pressure, 154,730 cal. If calcite were formed,  $\text{CaCN}_2 + 3/2 \text{O}_2 = \text{CaCO}_3 \text{ calcite} + \text{N}_2 + 196,730$  cal. The residue left after combustion should be pure  $\text{CaO}$ , but actually it showed a slight loss on ignition which was assumed to be due to  $\text{CaCO}_3$  or  $\text{Ca(OH)}_2$ . This would require a small correction of about 7-26 cal., but the author did not attempt to make these corrections. From these results the following heats of formation were calcd.:  $\text{Ca} + \text{diamond} + \text{N}_2 = \text{CaCN}_2 + 91,480$  cal.  $\text{Ca} + \text{C amorphous} + \text{N}_2 = \text{CaCN}_2 + 94,820$  cal.  $\text{CaC}_2 + \text{N}_2 = \text{CaCN}_2 + \text{C graphite} + 77,830$  cal.  $\text{CaC}_2 + \text{N}_2 = \text{CaCN}_2 + \text{C amorphous} + 74,990$  cal. This amounts to about 2.78 kg. cal. for 1 g.  $\text{N}_2$  fixed in the case of graphite. If the heat loss due to radiation, convection, etc., of an industrial cyanamide furnace of the continuous working type be less than this amt., no external heat supply will be necessary after azotization has once been started. Other heats of reaction are:  $\text{CaCN}_2 + 3 \text{H}_2\text{O liquid} = \text{CaCO}_3 \text{ calcite} + 2 \text{NH}_3 \text{ gas} + 14,130$  cal.  $\text{CaCN}_2 + \text{C} + 2 \text{KCl} = \text{CaCl}_2 + 2 \text{KCN} + Q$ .  $Q = -55,720$  cal. for amorphous C, and  $-58,560$  cal. for graphite.  $\text{CaCN}_2 + \text{CO} = \text{CaO} + 2 \text{C amorphous} + \text{N}_2 + 27,640$  cal.  $2\text{CaCN}_2 + \text{CO}_2 = 2 \text{CaO} + 3 \text{C amorphous} + 2 \text{N}_2 + 16,510$  cal.

From these heats of reaction and the approx. form of the Nernst heat equation the following results were calcd. For the reaction  $\text{CaC}_2 + \text{N}_2 = \text{CaCN}_2 + \text{C graphite}$ , the temp. at which the dissociation pressure of  $\text{N}_2$  is 1 atm. is  $1754^\circ$ . If the C is amorphous, this temp. is  $1690^\circ$ . For the reaction  $\text{CaCN}_2 + \text{CO} = \text{CaO} + 2 \text{C amorphous} + \text{N}_2$ ,  $\pm 27,640$  cal. the temp. is  $1831^\circ$  when  $p_{\text{CO}}/p_{\text{N}_2} = 0.01$ . This means that if suitable means could be found to accelerate the reaction velocity sufficiently  $\text{CaO}$  will be reduced and  $\text{N}_2$  fixed at this temp. until the partial pressure of  $\text{CO}$  is 1% of that of the  $\text{N}_2$ . Of course the  $p_{\text{N}_2}$  should be great enough to overcome the dissociation of  $\text{CaCN}_2$ . For the incomplete reduction of  $\text{CO}_2$ ,  $\text{CaCN}_2 + 2\text{CO}_2 = \text{CaO} + 3\text{CO} + \text{N}_2 - 49,900 \text{ cal.}$ ,  $\log[p^{\text{CO}_2}/(p^{\text{CO}_2} p_{\text{N}_2})] = -6.3$  at  $727^\circ$  and  $-8.95$  at  $1000^\circ$ . For the complete reduction of  $\text{CO}_2$ ,  $2\text{CaCN}_2 + \text{CO}_2 = 2\text{CaO} + 3\text{C amorphous} + 2\text{N}_2 + 16,510 \text{ cal.}$ ,  $\log(p_{\text{CO}_2}/p^{\text{N}_2}) = -10.27$  at  $1000^\circ$ . These results show that the reverse reactions are practically impossible. For the reaction  $2 \text{CaCN}_2 + 3 \text{O}_2 = 2 \text{CaO} + 2 \text{CO}_2 + 2 \text{N}_2 + (2 \times 164,730) \text{ cal.}$ ,  $\log[p^{\text{O}_2}/(p^{\text{CO}_2} p^{\text{N}_2})] = -61.8$  at  $1000^\circ$ . Therefore, oxidation is practically complete.

R. H. LOMBARD

A form of labile hydratation fixed with mercury cyanide. G. SCAGLIARINI AND E. BONTINI. Univ. Bologna. *Gazz. chim. ital.* 50, II, 114-7 (1920).—Barbieri and Calzolari (*C. A.* 5, 1279, 1896; *Atti accad. Lincei* 21, I, 563 (1912); 27, I, 787 (1918)) have used hexamethylenetetramine and caffeine to fix  $\text{H}_2\text{O}$  in hydrates of higher  $\text{H}_2\text{O}$  content than can ordinarily be sepd. from aq. solns. That higher hydrates than those ordinarily isolated exist in aq. soln. was proved by diffusion velocity expts. of Padoa and Corsini (*C. A.* 10, 1457), by which  $\text{EtOH}$  was found to have 15 mols. of  $\text{H}_2\text{O}$  attached. Kurnakow (*Z. anorg. Chem.* 17, 221 (1898)) had used platinous chloride and  $\text{Hg}(\text{CN})_2$  for obtaining hydrated halides of the alk. earth metals having 6  $\text{H}_2\text{O}$ . S. and B. proposed to extend this study and if possible det. how the  $\text{Hg}(\text{CN})_2$  is bound in these complexes. Two salts  $\text{CoSO}_4 \cdot 10\text{H}_2\text{O} \cdot \text{Hg}(\text{CN})_2$  and  $\text{NiSO}_4 \cdot 10\text{H}_2\text{O} \cdot \text{Hg}(\text{CN})_2$  were obtained and analyzed. The corresponding nitrates with 6  $\text{H}_2\text{O}$  were prepd. but did not give good analytical results. B. and B. consider the bases in their complexes to be bound to the metallic atom in spite of the fact that the color of the solns. remains unchanged on adding the base. Not so with  $\text{Hg}(\text{CN})_2$ . The Co complex is red-orange and that of Ni green-blue; colors similar to those of the corresponding  $\text{NH}_3$  complexes. On electrolysis the  $\text{Hg}(\text{CN})_2$  goes to the cathode with the Co and the  $\text{H}_2\text{SO}_4$  to the anode, showing that the complexity is in the cation. These salts were obtained by mixing sulfate and  $\text{Hg}(\text{CN})_2$  in equimol. amts., boiling 15 mins. and allowing to crystallize.

E. J. WITTMANN

Crystalline magnesium carbonate. T. C. N. BROEKSMIT. Amsterdam. *Pharm. Weekblad.* 58, 210-12 (1921).—The amorphous  $\text{MgCO}_3$ , obtained by treating  $\text{MgSO}_4$  soln. with  $\text{Na}_2\text{CO}_3$  or  $(\text{NH}_4)_2\text{CO}_3$  soln., changes slowly into a cryst. form. The amorphous substance is not a double salt of carbonate and sulfate. JULIAN F. SMITH

Normal tungstate and molybdate of bismuth: their relations with the corresponding compounds of lead. F. ZAMBONINI. Univ. Turin. *Gazz. chim. ital.* 50, II, 128-46 (1920).—Bodman (*Z. anorg. Chem.* 27, 254 (1901)) found that some of the nitrates and sulfates of Bi and some of the metals of the Ce and Yt group are isomorphogens. In previous work (*Riv. ital. min.* 45, 1-185 (1915); cf. *C. A.* 10, 2440), Z. showed that the rare earth metals are in many compds. isomorphogens with Ca, Sr, Ba and Pb in which perhaps 2 Bi'' was replaced by 3 R. The tungstates and molybdates seemed especially adapted for a study of the isomorphism of Bi and Pb. This paper constitutes a description of these new compds. of Bi and gives the results of a thermal analysis of the 2 binary systems.  $\text{Bi}_2(\text{WO}_4)_3$  was easily obtained by fusing an intimate mixt. of  $\text{Bi}_2\text{O}_3$  and  $\text{WO}_3$  in the calcd. proportions. By allowing the mass to cool slowly a homogeneous product was obtained in which neither of the uncombined components could be de-

ected. The compd. was greenish gray in color and gave few good crystals, for which the crystallographic data are given.  $\text{Bi}_2(\text{WO}_4)_3$  is dimorphous. The form obtained above is the monoclinic phase. This was heated for 3 hrs. at 900–1000° with excess  $\text{NaCl}$  and then lixiviated with  $\text{H}_2\text{O}$ . The residue composed mostly of unchanged  $\text{Bi}_2(\text{WO}_4)_3$  was accompanied by white bipyramidal crystals of the tetragonal phase. The crystallographic measurements correspond closely with those of the similar phase of the tungstate and the molybdates of the Yt and Ce groups as well as those of Ca, Sr, Ba and Pb. These 2 phases of  $\text{Bi}_2(\text{WO}_4)_3$  correspond closely in their measurements to those of tetragonal (stolzite) and monoclinic (raspite)  $\text{Pb}_2(\text{WO}_4)_3$  found in nature.  $\text{Bi}_2(\text{MoO}_4)_3$  was easily prepd. by fusing  $\text{Bi}_2\text{O}_3$  and  $\text{MoO}_3$  together, with the latter in slight excess owing to its volatility. The fused compd. crystallizes in minute tetragonal pyramids and resembled the corresponding compds. of Ca, Sr, Ba and Pb. In order to det. if the formation of solid solns. between the tungstates and molybdates of Pb and Bi resp. may be practically realized Z. carried out the thermal analysis of the systems  $\text{PbWO}_4$ – $\text{Bi}_2(\text{WO}_4)_3$  and  $\text{PbMoO}_4$ – $\text{Bi}_2(\text{MoO}_4)_3$ . For the 1st of these the curve of primary crystallization descends rapidly from the f. p. of  $\text{PbWO}_4$  (1130°) to the eutectic point at 73 mol. %  $\text{Bi}_2(\text{WO}_4)_3$  at 813° and then rises to the f. p. of  $\text{Bi}_2(\text{WO}_4)_3$  at 832°. The miscibility of these 2 salts is almost certainly zero under these conditions. The system  $\text{PbMoO}_4$ – $\text{Bi}_2(\text{MoO}_4)_3$  behaves similarly. The curve of primary crystallization falls rapidly from the m. p. of  $\text{PbMoO}_4$  at 1065° to the eutectic point at 71.5 mol. %  $\text{Bi}_2(\text{MoO}_4)_3$  at 615° and then rises directly to the m. p. of  $\text{Bi}_2(\text{MoO}_4)_3$  at 643°. On the basis of these results Bi resembles Yt the molybdate of which only gives mixed crystals with  $\text{PbMoO}_4$  under special conditions, in spite of the similarity of the crystals in this case also. Accordingly Z. heated 7 g.  $\text{Na}_2\text{MoO}_4$ , 4 g.  $\text{PbCl}_2$  and 1 g.  $\text{Bi}_2(\text{MoO}_4)_3$  at 1000° for 1 hr. On lixiviating this mass when cool tetragonal crystals were isolated which contained 9% by wt. of  $\text{Bi}_2(\text{MoO}_4)_3$ . This result shows that Bi may be isomorphous with Pb. Z. closes his paper with several pages of general discussion. E. J. WITZEMANN

The solubility of halogens in their corresponding acids and salts. II. E. OLIVIERI-MANDALÀ. Univ. Palermo. *Gazz. chim. ital.* 50, 89–98 (1920).—In a previous paper (*C. A.* 15, 478) O.-M. reported on the soly. of I in HI, HBr and HCl, resp. In this paper solubilities of Cl in solns. of NaCl and HCl and of Br in NaCl, in HCl and in HBr are given. Some data on the soly. of Cl in these solns. are given in the older literature. The soly. of Cl in HCl solns. is greater than in  $\text{H}_2\text{O}$ ; in NaCl solns. it is less than in  $\text{H}_2\text{O}$  and decreases markedly with the increase of concn. of the NaCl soln.  $\text{H}_2\text{O}$  at 20° and 761 mm. dissolves 2.114 and 2.132 vols. Cl (vol. = (g. Cl per l.  $\times$  22.4)/71). With NaCl at 20° and 762 mm. in 0.777% NaCl 1.577 vols. and in 3.597% 0.719 vol. Cl are dissolved. The soly. of Cl in NaCl conforms to the formula  $(\alpha' - \alpha)/M^{1/2} = K$  (in which  $\alpha'$  is the absorption coeff. of Cl in pure  $\text{H}_2\text{O}$  ( $v \times 760/p = \alpha'$ ),  $\alpha$  the same in the NaCl soln., and  $M$  the concn. in mols. per l.), which is an empirical formula that expresses the soly. of indifferent gases in aq. solns. of electrolytes (Gordon, *Z. physik. Chem.* 18, 1 (1895)). In this it differs from the other halogens, which have nearly the same soly. in the halogen acid as in the corresponding alkali salt. The soly. of Cl in HCl increases with the concn. of HCl and this is doubtless due to the formation of the polyhalogen acid,  $\text{HCl}_3$ , which Bertholet (*Compt. rend.* 100, 761 (1885)) suggested to account for the heat of soln. and which Paterno and Oliveri (*Z. physik. Chem.* 44, 600 (1903)) found cryoscopically. Br is little more sol. in HBr than in KBr; in this respect it resembles I, which is but little more sol. in HI than in KI. E. J. W.

System antimony sulfide-lead sulfide (IITSUKA) 8. System antimony sulfide-silver sulfide (KONNO) 2. System bismuth sulfide-antimony sulfide (TAKAHOSHI) 2. Speed of reaction of metallic magnesium in aqueous solutions (VYSKOČIL) 2.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Review of analytical chemistry. G. DENIGÈS. *Rev. gén. sci.* 32, 48-54, 70-85 (1921). E. H.

Analytical microscopy. IX. T. E. WALLIS. *Pharm. J.* 105, 376-8 (1920); cf. *C. A.* 14, 3806.—The topics discussed are micro sublimation, microchem. pptn. and staining. X. *Ibid.* 530-1. The use of micrometers, and the camera lucida for the purposes of drawing are explained; detailed sketches are given. XI. *Ibid.* 106, 48-51 (1921). An account of quant. microscopy (cf. *C. A.* 11, 428; 14, 93) concludes the series.

S. WALDBOTT

Report on nitrogen. H. D. HASKINS AND I. K. PHELPS. *J. Assoc. Off. Agr. Chem.* 4, 66-9 (1920).—As a result of a collaborative study of different methods for the analysis of  $\text{NaNO}_3$ , and of the use of  $\text{Na}_2\text{SO}_4$  in place of  $\text{K}_2\text{SO}_4$  in the Gunning method it is recommended that the West Coast refraction method for  $\text{NaNO}_3$  analysis be discontinued and that the use of  $\text{Na}_2\text{SO}_4$  in the Gunning method be made official. W. H. ROSS

A note on permanganate titrations. A. RENNED MYBILL. *Chem. Age* (London) 4, 151 (1921).—In permanganate work it is necessary to remember that filters of filter paper have a reducing effect.

W. T. H.

Chloroform solutions of hydrogen chloride. E. J. WILLIAMS. *Chem. News* 122, 62 (1921).—On attempting to prepare a standard soln. of  $\text{HCl}$  in  $\text{CHCl}_3$  it was found by titration with standard alkali that, while  $\text{HCl}$  can be absorbed by  $\text{CHCl}_3$  up to a concn. of about 10 g. per l., unless the soln. is kept in a closed vessel, the gas passes completely out of the soln.

JEROME ALEXANDER

Rapid iodometric method for the determination of chromium in chromite. ERNEST LITTLE AND JOSEPH COSTA. *J. Ind. Eng. Chem.* 13, 228-30 (1921).—The  $\text{Cr}$  is oxidized to  $\text{CrO}_4^{--}$  and reduced by  $\text{HI}$  in the presence of trivalent  $\text{Fe}$  which is unreduced on account of being present in a complex fluoride anion. *Procedure.* Fuse 0.4 g. ore with 5 g. of  $\text{Na}_2\text{O}_2$ . Ext. with water and boil to expel excess peroxide. Acidify with  $\text{HCl}$  and add 5 cc. of concd. acid in excess for each 100 cc. of soln. Add  $\text{NH}_4\text{F}$  until no test for  $\text{Fe}$  is obtained with ferrocyanide on a spot plate. Add 1 g. of fluoride in excess, 3 g. of  $\text{KI}$  and titrate with thiosulfate.

W. T. H.

Methods of ore sampling in Montana. I. H. B. PULSIFER. *Min. Sci. Press* 121, 366-70 (1920).—Good grab sampling often suffices for  $\text{Fe}$  ores, limestone and coal but for rich metal ores such as  $\text{Au}$ ,  $\text{Ag}$ ,  $\text{Zn}$ ,  $\text{Cu}$  and  $\text{Pb}$  a precision in sampling of 1 part in 100 may be demanded. Results of the Mont. State Bureau of Mines tests brought out the fact that the degree of precision is a function of the amt. of the element detd.  $\text{Cu}$  ores are easier to sample than  $\text{Pb}$ ,  $\text{Zn}$  and  $\text{Ag}$  and  $\text{Au}$  is the most difficult. Sampling costs are discussed. II. *Ibid.* 907-12.—Details are given for carrying out accurate pipe and hand sampling. A description is given of the flowsheet and equipment of the Washore, Anaconda, East Butte and East Helena plants.

A. H. HELLER

Sundry details of sampling at the Garfield smelter. ARTHUR B. PARSONS. *Min. Sci. Press* 122, 17-22 (1921).—The Martin unloading and sampling machine is used. A description of the ore sampling mill is given, together with equipment and procedure followed in the bucking room.

A. H. HELLER

New method for the determination of potassium in silicates. JEROME J. MORGAN. *J. Ind. Eng. Chem.* 13, 225-7 (1921).—The proposed method is simple and accurate when the material is practically free from  $\text{S}$  compds. It does not require fine grinding and there is no danger of loss by volatilization. *Procedure.* Digest 0.5 g. of silicate with  $\text{HF}$  and evap. the excess. Add 25 cc. of 3  $N$   $\text{HCl}$ , heat until a fairly clear soln. is obtained and evap. with 10 cc. of 10%  $\text{HClO}_4$ . Dissolve the residue in hot water. Add 2 cc. more of  $\text{HClO}_4$  and again evap. to fumes. Repeat if necessary until one evapn.

has been made after a clear soln. in water was obtained. Cool, add 20 cc. of alc. containing 0.2%  $\text{HClO}_4$ , filter through a weighed Gooch crucible, wash with the same alc. soln. and dry at  $130^\circ$ .

W. T. H.

Centrifugal method for determining potash. ELMER SHERRILL. *J. Ind. Eng. Chem.* 13, 227-8(1921).—Five cc. of an approx. 1%  $\text{K}_2\text{O}$  soln. are transferred to a specially constructed centrifugal tube, which has the appearance of an inverted Babcock tube with the stem sealed and the bottom cut off, treated with 17 cc. of specially prepd.  $\text{Na}_2\text{Co}(\text{NO}_3)_6$  soln. and rotated 1000 times in a Babcock machine during 1 min. The depth of ppt. is then compared with that obtained in a similar tube containing a known quantity of potash.

W. T. H.

New method for separating and determining iron and manganese. C. KOLLO. *Bul. soc. chim. România* 2, 89-95(1921).—Hexamethylenetetramine acts as a weak base and causes the pptn. of  $\text{Fe}^{+++}$  as  $\text{Fe}(\text{OH})_3$  in neutral or slightly acid solns.  $\text{Mn}^{++}$  is precipitated only in hot, neutral solns. The sepn. of  $\text{Fe}^{+++}$  and  $\text{Mn}^{++}$  by means of  $(\text{CH}_3)_4\text{N}_4$  can take place in a vol. of 50 cc. for quantities corresponding to approx. 0.26 g.  $\text{FeSO}_4 \cdot \text{H}_2\text{O}$  and 0.28 g.  $\text{MnSO}_4 \cdot \text{H}_2\text{O}$ . To the neutral soln. add a few drops of mineral acid and then a 10 per cent. soln. of  $(\text{CH}_3)_4\text{N}_4$  until the pptn. of  $\text{Fe}(\text{OH})_3$  in the stirred soln. is complete and the supernatant liquid has no effect on Congo red paper. Heat on the water bath until the  $\text{Fe}(\text{OH})_3$  is coagulated. Filter, and wash with hot water until no test for  $\text{Mn}^{++}$  with  $(\text{NH}_4)_2\text{S}$  is obtained in the filtrate. The ppt. may be weighed as  $\text{Fe}_2\text{O}_3$  or dissolved and titrated iodometrically. If no other cations are present, the Mn can be detd. as  $\text{MnSO}_4$  by evap. the filtrate to dryness. If the Volhard method is to be used, evap. the filtrate to 5 cc., add 5 cc. of 6 N  $\text{H}_2\text{SO}_4$  and boil; this decomposes  $(\text{CH}_3)_4\text{N}_4$  with the formation of  $\text{HCHO}$  which is boiled off. W. T. H.

A simplified method for detecting sodium, potassium and magnesium ions in the presence of one another. EUGÈNE LUDWIG and HÉLÈNE SPIRESCU. *Bul. soc. chim. România* 2, 79-82(1921).—After the removal of  $\text{Ba}^{++}$ ,  $\text{Ca}^{++}$  and  $\text{Sr}^{++}$  in the usual way, evap. the soln. to dryness and ignite to expel  $\text{NH}_4$  salts. Take a little of the residual powder and test in the usual way to see if a ppt. of  $\text{MgNH}_4\text{PO}_4$  can be obtained. Test for  $\text{K}^+$  by attempting to obtain a black ppt. of  $\text{K}_2\text{CuPb}(\text{NO}_3)_6$  by adding a few grains of the powder to a mixture of 1 drop  $\text{Cu}(\text{OAc})_2$ , 1 drop  $\text{Pb}(\text{OAc})_2$  and 1 drop  $\text{KNO}_3$  soln. on the slide of a microscope. Test for  $\text{Na}^+$ , also under the microscope by adding a little of the powder to a drop of concd.  $\text{K}_2\text{CO}_3$  soln., evap. on the slide to dryness and testing with a drop of  $\text{K}_2\text{H}_2\text{Sb}_2\text{O}_7$  soln. The formation of amorphous basic carbonate of Mg does not lead to confusion during this test.

W. T. H.

Simplified procedure for the identification of silver, lead and mercury cations. C. KOLLO. *Bul. soc. chim. România* 2, 95-9(1921).—First test to see if any mercurous  $\text{Hg}_2$  is present by adding  $\text{HCl}$  to a soln. of a little of the substance, filtering and adding  $\text{NH}_4\text{OH}$  to the ppt. To the main portion of the soln. add enough  $\text{HCl}$  to ppt. all  $\text{Ag}^+$  and  $\text{Pb}^{++}$ . If mercurous  $\text{Hg}_2$  is present, add  $\text{Cl}_2$  to form  $\text{Hg}^{++}$ . Boil off the excess  $\text{Cl}_2$  and cool, preferably with ice. If a large ppt. is obtained use only a part of it for the Ag and Pb tests. Treat the ppt. on a watch glass with 4 or 5 drops of 10%  $\text{NaOH}$  to form  $\text{Na}_2\text{PbO}_2$ . Dil. with a few drops of water and heat gently to about  $40^\circ$ . Pipet off a little of the resulting soln. and transfer it to a watch glass. Add 2 or 3 drops of  $\text{AcOH}$  and touch the soln. with a rod which is wet with 10%  $\text{KI}$  soln. Crystals of  $\text{PbI}_2$  can be obtained in the analysis of 0.05 g. of a powder contg. 1 part  $\text{Pb}(\text{NO}_3)_2$  to 100 parts  $\text{AgNO}_3$ . To the remainder of the substance and soln., on the watch glass used for the  $\text{NaOH}$  treatment, add a little glucose, and heat gently. A mixt. of mol. Ag and colloidal Ag is obtained if this element is present. To test for Hg place a drop of the soln. from which  $\text{AgCl}$  and  $\text{PbCl}_2$  were pptd. upon a strip of Al. After a few seconds wash off with water and allow to stand. A white efflorescence of  $\text{Al}_2\text{O}_3$  is formed if Hg is present.

The iodometric titration of chromic acid. I. M. KOLTCHOFF. Pharmazeut. Lab. Utrecht. *Z. anal. Chem.* 59, 401-15(1920).—Meindl, Wagner and others have claimed that in the titration with  $\text{Na}_2\text{S}_2\text{O}_4$  of  $\text{I}_2$  liberated by the action of chromic acid upon  $\text{HI}$  too much reagent is used but, in the light of the expts. here described, the cause of the difficulty was probably too low acidity. If the soln. is 0.8 *N* in  $\text{HCl}$  accurate results are obtained and the titration can take place immediately. If the acidity is less, good results are usually obtained if the soln. is allowed to stand after the addition of  $\text{KI}$  and acid. The cause of the trouble has been traced to chromic acid, which reacts very slowly with iodide ions in slightly acid solns., but it is not clear why the chromic acid should cause increased consumption of  $\text{Na}_2\text{S}_2\text{O}_4$ . There is no advantage in diluting the soln. as is often recommended. Molybdate retards the action of chromic acid upon  $\text{HI}$ .  $\text{Fe}^{++}$  in strongly acid soln. acts as a negative catalyzer but the opposite effect is obtained in solns. of low acidity. Temp. has little effect. Standardization of  $\text{Na}_2\text{S}_2\text{O}_4$  against  $\text{K}_2\text{Cr}_2\text{O}_7$ , oxalic acid with  $\text{KI}$  and  $\text{KIO}_3$  in the presence of  $\text{CaCl}_2$  or  $\text{MgCl}_2$ ,  $\text{ICN}$ ,  $\text{KIO}_3$ , and  $\text{K}_2\text{CrO}_4$  showed agreement within 0.1% in every case.

W. T. HALL

Concerning a note by A. Bolland on the microchemical reactions of iodic acid. G. DEMIGES. *Compt. rend.* 172, 62-3(1921); cf. *C. A.* 15, 812.—Claim for priority and citation of papers published by D. in 1920.

W. T. H.

A rapid volumetric method for determining alcohol. ARTHUR LACHMAN. *J. Ind. Eng. Chem.* 13, 230(1921).—Add 25 g. of aniline to 50 cc. of alc.-water mixt. If a clear soln. is not obtained, add 25 cc. of alc. of known strength, or enough to give a clear soln. Then add water from a buret until a permanent turbidity is obtained. Note the temp. and est. the percent alc. from tables, which are not published.

W. T. H.

A volumetric method for the determination of lactose by alkaline potassium permanganate. FELIPE T. ADRIANO. *Philippine J. Sci.* 17, 213-20(1920).—In an Erlenmeyer flask, place 50 cc. of 0.1 *N*  $\text{KMnO}_4$ , 25 cc. of  $\text{Na}_2\text{CO}_3$  soln. (8.48 g. per liter) and 5 or 10 cc. of the filtrate obtained by dilg. 25 cc. of milk with 400 cc.  $\text{H}_2\text{O}$ , adding 10 cc. of 0.3 *N*  $\text{CuSO}_4$  soln., 8.8 cc. of 0.5 *N*  $\text{NaOH}$ , making up to 500 cc., mixing and filtering. Dilute the mixture to 100 cc. heat to 95° in 2 min. and continue heating 2 min. more. Remove the flask from the heat, add 25 cc. of 30%  $\text{H}_2\text{SO}_4$  and a measured vol. of 0.1 *N*  $\text{H}_2\text{C}_2\text{O}_4$ . Titrate the excess with  $\text{KMnO}_4$  and compute the wt. of lactose present from the following table:

Lactose. Mg.	0.1 <i>N</i> $\text{KMnO}_4$ . Cc.	Lactose. Mg.	0.1 <i>N</i> $\text{KMnO}_4$ . Cc.	Lactose. Mg.	0.1 <i>N</i> $\text{KMnO}_4$ . Cc.
1.....	2.51	14	16.72	28	30.60
2.....	3.21	15	17.85	29	31.49
3.....	4.04	16	19.04	30	32.55
4.....	4.39	17	20.16	31	34.65
5.....	5.47	18	20.96	32	35.69
6.....	6.52	19	21.50	33	36.16
7.....	7.09	20	22.89	34	37.26
8.....	9.13	21	23.63	35	38.26
9.....	9.98	22	24.87	36	38.64
10.....	11.37	23	25.92	37	39.28
11.....	12.30	24	26.67	38	40.16
12.....	13.80	25	28.10	39	40.56
13.....	15.41	26	28.39	40	41.47
		27	29.50		

W. T. H.

Microchemical identification of ammonia gas as picrate of hexamethylenetetramine. C. KOLLO AND V. TEODOSSIU. *Bul. soc. chim. România* 2, 100-2(1921).—If a drop of commercial formaldehyde together with an equal quantity of 1% picric acid soln. is



exposed to an atmosphere contg.  $\text{NH}_3$ , there is formed some hexamethylenetetramine which combines with picric acid and to form prismatic, yellow crystals. The test is made more sensitive by using a cold, satd. soln. of picric acid in commercial formaldehyde soln. and adding to the soln. a little hexamethylenetetramine. The hexamethylenetetramine picrate is practically insol. in picric acid soln. One drop of this reagent exposed on a microscope slide is used for the test. 1 mg. of  $\text{NH}_4\text{Cl}$  will furnish when treated with caustic alkali enough  $\text{NH}_3$  to give the test. W. T. H.

The separation of ptomaines from vegetable alkaloids in toxicological investigations. AL. IONESCU. *Bul. soc. chim. România* 2, 82-9(1921).—In toxicological work there is danger of ptomaines being mistaken for vegetable alkaloids such as strychnine, conine and morphine. In the hope of distinguishing between these two classes of substances, the effect of ptomaines on the activity of diastases, the effect of alkaloids on the activity of diastases and the effect of diastases on ptomaines and on alkaloids were studied and the following conclusions were drawn: (1) Invertin and amylase have no effect on ptomaines; pepsin has a slight effect and lessens their reducing power. (2) Tyrosinase and hemoglobin have a marked effect on ptomaines and take away their reducing power but without affecting their alkaloidal character. (3) Ptomaines and vegetable alkaloids do not affect the diastatic ferments. (4) The vegetable alkaloids have practically no effect on the action of diastases under the conditions of these expts. (5) The oxidation by means of hemoglobin can be used in practice to distinguish ptomaines from vegetable alkaloids. (6) Probably it is possible with other diastases and other conditions of experimentation to effect a more satisfactory differentiation. W. T. H.

A macro- and microchemical method for determining total solids in raw sugar and other substances. FERDINAND KRYZ. *Oesterr. Chem.-Ztg.* 24, 9(1921).—Instead of mixing the substance with sand in a weighed evap. dish, it is recommended to spread out the mass on a thin, weighed plate of glass. Drying at  $105^\circ$  then takes place more quickly and less weighing is required. The solids in viscous, saccharine after-products can be detd. by dilg. to a definite vol. and detg. the d. of the soln. If the liquid is not viscous, however, the above method is satisfactory. With a very small quantity of substance, the detn. can be made with a cover glass such as is used for microscopic slides. W. T. H.

The determination of iodides in the presence of iodates. V. THÜRINGER. *Bul. soc. chim. România* 2, 73-7(1921).—The method described is essentially the same as that of Dietz and Margosch except that  $\text{H}_2\text{SO}_4$  is used in place of  $\text{HCl}$ . In explaining the method of computation, the assumption is made that a normal soln. of  $\text{KIO}_3$  contains one mole per liter instead of one-sixth mole as generally taken. W. T. H.

JOHNSON, CHARLES M.: *Rapid Methods for the Chemical Analysis of Special Steels, Steel-making Alloys, their Ores and Graphites.* 3rd Ed. revised and enlarged. New York: John Wiley & Sons. 552 pp. \$6 net.

MATSUI, MOTO-OKI: *Denkai Bunseki (Electrolytic Analysis).* Tokyo: Shikōwa-hō. xii + 243 pp. 3.80 yen.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

**Metallographic investigation of the system antimony sulfide-lead sulfide.** DAIDAI IITSUKA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 81-4(1919); cf. C. A. 15, 40.—The author detd. by the cooling curve method the thermal equil. diagram for the system  $\text{Sb}_2\text{S}_3$ - $\text{PbS}$ . Conclusions: (1) Four compds. and two eutectics are formed in this

system. (2)  $\text{PbS.Sb}_2\text{S}_3$  exists below  $548^\circ$  and corresponds to the mineral *minckleyite*. It forms a eutectic (m. 428) with  $\text{Sb}_2\text{S}_3$ , containing 14% PbS. (3)  $3\text{PbS.2Sb}_2\text{S}_3$  forms below  $610^\circ$  and exists in two polymorphic forms ( $\alpha$  and  $\beta$ ) with transition point at  $510^\circ$ . The  $\alpha$  modification corresponds to the (supposed) mineral *warrenite*. (4)  $2\text{PbS.Sb}_2\text{S}_3$  (m.  $672^\circ$ ) is a formula once assigned to *jamesonite* (= *plumosite*). (5)  $5\text{PbS.2Sb}_2\text{S}_3$  exists below  $590^\circ$ . It exists in two allotropic modifications ( $\alpha$  and  $\beta$ ) with transition point at  $488^\circ$ . The  $\alpha$  modification corresponds to the mineral *boulangerite*. This compd. forms a eutectic (m.  $557^\circ$ ) with PbS which contains 78% PbS.

F. P. FLAGG

Investigations on Swedish apatites. KARL A. GRÖNWALL. *Geol. För. Förh.* 38, 411-34(1916).—Analysis of apatite from Nordmarken shows it to be a nearly pure fluorapatite, with only 0.05% Cl. Its sp. gr. = 3.194 and the best value for the axial ratio  $c = 0.7328$ . These data are close to those obtained on material of similar compn. elsewhere. This and an occurrence from Bolandsgrufvan are described crystallographically.

E. T. W.

New mineral analyses. HERMAN HEDSTRÖM. *Geol. För. Förh.* 38, 435-40(1916).—More or less complete analyses are given of apophyllite, melanotekite, and mangano-phyllite from Swedish localities.

E. T. W.

Investigation of iron ore deposits in northern Ontario. A. H. A. ROBINSON. *Summary Report Can. Dept. Mines No. 542*, 13-6(1920).—The deposits, mining operations, and output of Fe ores are described. Most of the ores appear too low in Ti to be worked for that element, and too high in Ti to be worked for Fe. A siderite deposit in the Michipicoten district is estd. to contain 100 million tons, 10 million of which are above tunnel level and can be mined without hoisting. This deposit runs about 37% Fe and can be roasted to 50% or better in Fe. Iron oxide pigments in the province of Quebec. HOWELLS FRÉCHETTE. *Ibid* 17-9.—In this preliminary survey the principal output was reported from Three Rivers and vicinity. Other deposits were examd. with the sampling drill, and a report of the analyses of these samples will appear later. Miscellaneous non-metallic minerals. HUGH S. SPENCE. *Ibid* 19-25.—Data are given of the locality, quality and output of talc and soapstone in Ontario, Quebec and B. C. The production has increased each year since 1914, the value for 1919 being \$116,295. Practically the entire production of *barytes* has been obtained from Inverness Co., Cape Breton Island. Many deposits of barytes in Nova Scotia, Quebec and Ontario were examd. Some of these deposits were decidedly promising. *Celestite*, in paying quantities, occurs in Leeds and Renfrew Counties, Ont. A grinding mill is being erected in the last named County. *Strontianite* was reported from 3 localities, but not in amts. to be of com. importance.

L. W. RIGGS

Iron and associated industries of Lorraine, Sarre District, Luxemburg and Belgium. ALFRED H. BROOKS and MORRIS F. LACROIX. U. S. Geol. Survey, *Bull.* 703, 127 pp. (1920).—The Fe-ore and coal deposits of these districts are described with statistics of output, ownership, and economic relations to other fields, particularly those of Westphalia.

L. W. RIGGS

Potash resources of Nebraska. W. B. HICKS. U. S. Geol. Survey *Bull.* 715-I, 125-39(1921).—More than 100 lakes which produce K are scattered over some 800 square miles of northwestern Nebraska. These range in size from ponds to 600 acres and depth from practically nothing to 5 ft. The estd.  $\text{K}_2\text{O}$  content of the lakes thus far studied is placed at 215,110 tons. The brines run from 1 to 10% of solids, of which the  $\text{K}_2\text{O}$  content in 15 lakes ranges from 9.15 to 28.75%, av. 22%. The origin of the K is believed to be from leachings of ashes from fires and to weathering of sands containing feldspar. Water from deep borings in this region is generally fresh. It appears probable that no large  $\text{K}_2\text{O}$  reserves will be found in regions not occupied by lakes.

L. W. RIGGS

Phosphate rock near Marville, Granite Co., Montana. J. T. FARBER. U. S. Geol. Survey, *Bull.* 715-J, 141-5(1921).—The most promising outcrops are in the Douglass Mt. and Princeton anticlines where the limit of profitable mining is placed at more than 100 million tons. Analyses of 5 samples gave  $\text{Ca}_3(\text{PO}_4)_2$  ranging from 67.3 to 68.8%. L. W. RHOADS

Gems and precious stones in 1919. B. H. STODDARD. U. S. Geol. Survey, *Mineral Resources of U. S. 1919*, Part II, 165-80 (preprint No. 11, published Feb. 9, 1921). E. H.

Precious stones. GRO. F. KUNZ. *Eng. Mining J.* 111, 160(1921).—A review of mining and industry in 1920. E. J. C.

Annual report on the mineral production of Canada during 1919. JOHN McLEISH. Can. Dept. of Mines, Mines Branch, *Publ. No.* 545, 82 pp.(1920). E. J. C.

Preliminary report on the mineral production of Canada during 1920. JOHN McLEISH. Can. Dept. of Mines, Mines Branch, *Publ. No.* 554, 24 pp.(1921). E. J. C.

A lamprophyric dike rock from Eksjö. HERMAN HEDSTRÖM. *Geol. För. Förh.* 38 441-5(1916).—The rock is described petrographically and an analysis by R. Mauzelius is given, with calcn. of the norms and the Osann constants. E. T. W.

Features of a body of anorthosite-gabbro in northern New York. WILLIAM J. MILLER. *J. Geology* 29, 29-47(1921).—The body of rock described varies from true anorthosite, through anorthosite-gabbro, to a true gabbro. It is  $4\frac{1}{2}$  mi. long, has max. width of 1 mi., and is located near the central part of the Russell quadrangle in St. Lawrence Co. A detailed description is given of the megascopic and microscopical features, field relations and origin of the various facies of this body and associated rocks. One important feature is the close association of facies of very different compn. These facies occur in well defined belts. It is thought that the variations in compn., structure and texture are largely primary features. In various places the rock is cut by a network of numerous dikes. In some instances it is highly foliated, consisting of scapolite and hornblende with some quartz. Here the lack of sharp contacts indicates intrusion of dike material into the gabbro while the latter was still hot though nearly consolidated. In other places dikes rich in plagioclase and scapolite or hornblende are noted. In the extreme northern area a pegmatite dike cuts the gabbro in the form of a lens consisting of oligoclase and green monoclinic pyroxene and quartz. This dike is believed to be an offshoot of the adjacent granite which passing through the gabbro dissolved materials from the gabbro giving rise to the basic, pyroxene-rich pegmatite. W. F. HUNT

The microscopic examination of iron ores (SCHNEIDERHOLM) 9. Ores tested by Canadian Dept. of Mines (TIMM, CARNOCHAN) 9. System antimony sulfide-silver sulfide (KONNO) 2. Peat deposits in the United States and their classification (DACHNOWSKI) 21.

### 9—METALLURGY AND METALLOGRAPHY

WILLIAM BRADY, ROBERT S. WILLIAMS

French metallurgy and the World War. LÉON GUILLET. *Rev. metall.* 18, 1-22 (1921). E. J. C.

Metallurgy from the colloid-chemistry standpoint. CLIFFORD W. NASH. *Chem. Eng. Mining Rev.* 13, 11-3, 52-4(1921).—A general discussion of the application of the principles of colloid chemistry to metallurgy. Many problems which should be studied from the colloid-chemical standpoint are discussed, among them pptn. of metals from slags and mats, relation between physical properties and degree of dispersion and the adsorption of gases by metals. R. S. DEAN

**The flotation method of ore concentration.** ALEXANDER NATHANSON. *Umschau* 24, 645-6(1920).—The flotation method of ore concn., already so widely used in America and Australia, is to be studied scientifically at the Kaiser Wilhelm Institut für physikalische Chemie. The author assumes that the methods used in America have been purely empirical. The article consists of a popular explanation of the usual method of wet concn. of ores. The method fails when ore and gang must be very finely crushed to effect a sepn. Surface tension then interferes with settling of particles in the order of specific gravities. If, however, a small amt. of oil is intimately mixed with the fine particles suspended in water, the sulfide minerals are readily wet by the oil, while the gang minerals are not. Bubbles of gas produced by any appropriate means carry the oil-laden sulfide minerals to the surface, forming a froth, which is skimmed off. The ang sinks. No improvements are suggested.

J. O. HANBY

**Consumption of reagents used in flotation.** THOMAS VARLEY. *Bur. Mines Repts. of Investigations* No. 2203, (1921); *Can. Chem., Met.* 5, 51-2; *Eng. Mining J.* 111, 308.—Reports show that 26,545,564 tons of all kinds of ore were treated in 1919 by the flotation process, producing 3,105,343 tons of concentrates. The total of oil and other reagents used was 113,510,234 lbs. The reagents used in greatest amt. for treating various ores were as follows: Gold-silver ores: fuel oil, pine tar oil and turpentine; copper ores: coal tars, sulfuric acid, kerosene acid sludge and pine oil; lead-silver ores: hardwood creosotes, coal tars and crude petroleum; zinc ores: pine oils and copper sulfate. This report gives the amt. of all reagents used on the various classes of ore.

R. S. DRAN

**The microscopic examination of iron ores with special reference to their adaptability to concentration.** HANS SCHNEIDERHÜHN. *Stahl u. Eisen* 40, 1362-5(1920).—Important information regarding the ores is obtained by microscopic examn. which is not only useful in concn. work but as giving general knowledge regarding the geol. formations.

CARLE R. HAYWARD

**Ores tested and reports thereon.** W. B. TIMM AND R. K. CARNOCHAN. *Summary Report Can. Dept. Mines* No. 542, 54-99(1920).—Twenty-four samples of ores ranging in wt. from 6 lbs. to 30 tons, and representing a dozen metals, were subjected to metallurgical analysis by modern methods and the yields of concentrates, middlings, tailings, etc., tabulated. Comments on the compn., costs and probabilities of successful reduction are given for nearly every ore studied. Aluminium and its sources. R. T. ELWORTHY. *Ibid* 109-13.—An interesting summary of the chemistry and metallurgy of Al is given. As bauxite has not been found in com. quantities in Canada, Goldschmidt's process for obtaining Al from laboradorite is described, and attention called to Canadian anorthosite and nephelite as sources of Al.

L. W. RIGGS

**Gas-fired melting furnaces.** HEINRICH LININGER. *Z. Ver. Gas-Wasserfach.* 61, 2-4(1921).—Gas-fired furnaces for melting alloys replaced coke-fired furnaces with complete success. The lay-out is described and illustrated.

W. C. RBAUGH

**Polymultiple flame combustion in metallurgical furnaces.** ANON. *Genie civil* 76, 336-7; *Mech. Eng.* 42, 405-6(1920).—The principle and the method of operation of the Chautrairie metallurgical furnace are described. If a jet of gas passes into air as in an ordinary furnace, combustion occurs on the periphery of the jet, and heat radiates mainly into the air, which is permeable to radiant heat. If a jet of air enters an atm. of combustible gas, the heat radiation nearly all remains in the air of the jet, because the adjacent unburned combustible gas is practically impermeable to radiant heat. The tip of such a flame is many times hotter than that of a flame produced by burning a gas jet in air. The combustion is practically perfect even with a very slight excess of air. The Chautrairie furnace consists of a double roof, the lower part of which is perforated. The air enters through regenerators, and fills the space in the double roof, passing thence down into the furnace. Gas is conducted from producers to the

furnace, which it enters at a point just under the perforated roof. The rate of gas flow is so adjusted that there is a continuous sheet of combustible gas under this entire perforated roof at all times. Air enters through the multitude of perforations and combustion takes place in the form of jets of flame, which attain a max. temp. because the heat of combustion radiates back into the air itself, rather than through the sheet of combustible gas, which is practically impermeable to such radiation. The products of combustion are exhausted solely by the pressure in the combustion chamber, whereas in the furnace of ordinary type much heat is wasted by overheating the sides and roof of the furnace. Such overheating does not take place in the Chautrairie system because the sheet of combustible gas protects the roof and sides and, further, because the air entering through the perforations in the roof keeps down its temp. The heat is conveyed very directly and efficiently by the compact bundle of jets or darts of flame to the charge in the furnace. Undesirable oxidation may be prevented and an economy of fuel as great as 40% may be effected. Maintenance costs and metal losses are lower. Steel melting and reheating furnaces may be advantageously constructed on this system.

JAS. O. HANDY

Heat flow in the checkerwork of blast stoves and regenerative chambers. G. NEUMANN. *Stahl u. Eisen* 40, 1473-9(1920).—The thickness of the brick is not so important as previously supposed. Aside from lessening the heating surface bricks 8 cm. thick can be used. Practically nothing is gained by replacing the clay bricks in the lower part of the Cowper stoves with cast iron. The surface works most efficiently in prolonged heating and an equal period of cooling. Tests where the wind period was less than the gas period were less efficient.

CARLE R. HAYWARD

Waste-heat utilization. G. R. McDERMOTT AND F. H. WILLCOX. *J. Western Soc. Eng.* (Chicago) 26, 60-76(1921).—The gases leaving regeneration or recuperation furnaces commonly waste 35 to 55% of the total heat available in the fuel fired. Non-regenerative furnaces may waste as high as 80%. Much of this heat is not only recoverable but in 1 yr. will yield returns netting 25 to 75% of the cost of installing equipment. This paper refers principally to the waste-heat fire-tube boilers for open-hearth furnaces developed by Bacon for the Ill. Steel Co. at So. Chicago. Specific figures are cited showing amts. of waste gases from certain typical heats and the principles of their utilization are discussed.

S. D. KIRKPATRICK

The steel, cast iron, and malleabilizing foundry of G. Krauthelm in Chemnitz. PAUL SCHIMPFER. *Stahl u. Eisen* 40, 1293-1300, 1443-8(1920).

C. R. H.

The influence of temperature, pressure and humidity of atmospheric air on blast-furnace operations. ALFONS WAGNER. *Stahl u. Eisen* 40, 1397-1403(1920).—The operating records of 3 blast furnaces were compared with official meteorological records during the year. The results are given in tables and curves. The curve for wt. of air per cu. m. corresponds in general with the curve for blast pressure. With general blast conditions the same, the lowest blast pressure and the highest production were reached in May. The coke consumption was not influenced by the fluctuating humidity.

CARLE R. HAYWARD

Gases from iron. E. PIWOWARSKY. *Stahl u. Eisen* 40, 1365-6(1920).—Basic pig iron from the beginning, middle and end of a tap was run into a mold equipped with a device for collecting the gas evolved during solidification. Five analyses were made from each lot. The av. analysis of the first lot was CO<sub>2</sub> 0.62, CO 28.73, H 21.3 and N 27.74%. The second lot analyzed CO<sub>2</sub> 0.55, CO 39.25, H 46.80, and N 12.98%. The av. analysis of the third lot was CO<sub>2</sub> 0.38, CO 42.62, H 46.92, and N 10.84%.

CARLE R. HAYWARD

The conservation of manganese in the basic open-hearth furnace. ERICH KILLING. *Stahl u. Eisen* 40, 1545-7(1920); cf. C. A. 14, 2606.—Mn will be saved by keeping in mind the greatest Mn reduction from the slag, by keeping the Mn additions as low as

possible by the smallest possible addition of elements forming lime compds., by high temp. and by adding Mn in the metallic state.

CARLE R. HAYWARD

**Desulfuring in the open-hearth furnace with simultaneous recovery of zinc oxide.** R. W. MEYER. *Stahl u. Eisen* 40, 1193-6(1920).—The furnace is designed to treat galvanized scrap carrying about 8% Zn. The furnace is arranged so that the outgoing gases may at will be passed into a series of cooling chambers and thence to the bag house. This is done during the first part of the heat. It takes about 2 hrs. to expel the Zn. When it is apparent that the Zn is removed the gases are turned into the regenerative chamber and the remainder of the process proceeds in the normal way. Little time is lost by this method.

CARLE R. HAYWARD

**Metallurgical operations of the Judge Mining and Smelting Company.** ARTHUR B. PARSONS. *Mining Sci. Press* 122, 153-9(1921).—The mine produces a shipping and a concg. ore, from the latter of which 2 concentrates are made, by a combination of jigging, tabling and flotation. Analyses of ores and concentrates are given. The process of treating the Zn concentrate consists of drying and grinding, roasting, leaching by agitation, filtration, purification of the soln., clarifying, electrolytic pptn. of the Zn, and melting and casting of Zn cathodes. A flow sheet of the Zn plant is given; novel features consist in adding 3% coarse leached residue, containing 20% Zn, to the roaster feed to promote porosity and reduce fusion. In roasting a temp. of 450-650° is maintained, and the hottest hearths are water-cooled. The sulfide S is reduced from 30 to 2%. In leaching the calcine an intermittent process is used, the cycle being 6-8 hrs.; it consists of pulping 33 tons of spent soln. carrying 45 g. acid per l., with enough calcine to bring acidity down to 1 g. per l. For final neutralization 100 lb. crushed limestone for each g. acid per l., together with 125 lbs. of  $\text{Ca}(\text{OH})_2$  are used.  $\text{FeSO}_4$  is oxidized to  $\text{Fe}_2(\text{SO}_4)_3$  at this stage by a combination of air and  $\text{MnO}_2$ . Oliver and American filters are used in series. The coarser material, previously rejected by classifiers, is 20% by wt. of the total residue and contains 20% Zn, while the filter cake contains 12.8% Zn. The total residue contains 20 ounces Ag. In deposition 80% current efficiency is obtained, and the effluent soln. contains 20 g. Zn per l. The cathodes are stripped when the deposit is  $1/16$  in. thick, and are melted in a reverberatory at 700°, 15% loss from dross resulting. The final ingots average 99.94% Zn. A. H. HELLER.

**Industrial development of zinc.** STEPHEN S. TUTHILL. *Eng. Mining J.* 111, 426-7(1921).

E. J. C.

**Selective converting at Clifton, Ariz.** J. OWEN AMBLER. *Eng. Mining J.* 111, 287-8(1921).—Cu bullion produced by the Arizona Copper Co. at Clifton av. only 5 oz. Ag and 0.15 oz. Au per ton, and formerly was sold without electrolytic refining. The converter charge is now blown to white metal as usual, but the blow is stopped when only part of the white metal has been converted to blister Cu. The overlying white metal is then poured off; the Cu, having a greater affinity for Au and Ag than white metal has, is enriched in the precious metals. After a few min. blow to finish the blister, due to some white metal not being removed by the pour, this enriched Cu is cast and the white metal is poured back for finishing. Only one shell is being used; the use of two would prevent contamination of one product by residue from the other. About 90% of the total Au charged could be recovered in only 7.5% of enriched product, but the Ag recovery is about proportional to the percentage of enriched product. The percentage made is governed by market conditions. The control of this percentage in blowing was difficult until the operators became experienced.

A. BUTTS

**Copper losses in slags.** FRANK E. LAYNE. *Eng. Mining J.* 110, 1076-80(1920); cf. C. A. 14, 3034.—Investigation of methods for detg. amts. of sulfide and oxide present in slag. Analyses of characteristic slags and their interpretation are given. The practice of pouring converter slag into blast furnace slag settlers is criticized. Four prior articles are reviewed. Conclusions are contradictory. The limitation of the Van Barne-

weld and Leavey 3%  $\text{SO}_2$  reagent for dissolving oxidized Cu compds. (C. A. 12, 1039) is that it does not thoroughly decompose air-cooled slags. If  $\text{FeS}_2$  is present, oxidized Cu is incompletely sol. or is afterward pptd. as sulfide. Low results are obtained, although the solvent dissolves silicates, carbonates and cuprous or cupric oxides, and not sulfides. Maier and Van Arsdale's  $\text{AgNO}_3$  reagent (C. A. 13, 1810) is supposed to dissolve sulfides only. It does not dissolve sulfides in all combinations and does not distinguish between dissolved and suspended sulfides.  $\text{CuO}$  is slowly attacked and  $\text{Cu}_2\text{O}$  partly dissolved. Fe does not interfere except to cause the use of more reagent. The use of  $\text{AgNO}_3$  was abandoned also by Wanjukov (*Metallurgie* 9, 1, 48(1912)). Two g. of 200-mesh ore are treated cold with 100 cc. 3%  $\text{SO}_2$  and 10 cc. HF in a stoppered bottle. Five cc. more HF are added if necessary. 24 hrs. is usually enough. After filtering  $\text{SO}_2$  is boiled off and Cu detd. In blast furnace slags total Cu = 0.05-0.44%; Cu sol. in  $\text{H}_2\text{SO}_4$  = 0-0.14%; Cu sol. in HF and  $\text{H}_2\text{SO}_4$  (oxidized Cu) = 0.015-0.34%; % oxidized to total Cu = 7-81. In reveratory slags total Cu = 0.145-0.60%; Cu sol. in  $\text{H}_2\text{SO}_4$  = 0.03-0.155%; Cu sol. in HF and  $\text{H}_2\text{SO}_4$  = 0.07-0.30%; % oxidized to total Cu = 40-83. In converter slags total Cu = 0.845-4.88%; Cu sol. in  $\text{H}_2\text{SO}_4$  = 0.045-2.76%; Cu sol. in HF and  $\text{H}_2\text{SO}_4$  = 0.06-3.85%; % oxidized to total Cu = 5-79. The causes of the variations are discussed. A method is given of calcg. the loss by pouring converter slag into blast furnace settlers. The effect of variation in blast furnace charges upon the Cu content of slags is given in tabular form. The detn. of suspended sulfides as distinguished from those chemically dissolved is calculable by a method which is given. Possible improvements in Cu furnace practice are suggested.

JAS. O. HANDY

More about copper losses in slags. FRANK E. LATHE. *Eng. Mining J.* 111, 257(1921); cf. C. A. 14, 3034 and preceding abstract.—This is a continuation of the discussion of the best methods for examg. copper slags to det. the forms in which the copper exists. If these can be positively identified, means for lessening copper losses may be devised. L. uses a mixt. of HF and  $\text{H}_2\text{SO}_4$  to dissolve the copper present in oxides and in metallic form. He approximates the amt. of suspended matter from the ratio of gold to copper in the slag. The defect of Maier's  $\text{AgNO}_3$  method is the solvent action of the reagent on fused sulfides and oxides of copper.

J. O. HANDY

Sidelights on the cyanidation process. ALFRED JAMES. *Eng. Mining J.* 111, 102-4(1921).—A discussion of a number of "sidelights" contg. nothing new.

JAS. O. HANDY

Ductility testing machines. THORSTEN Y. OLSEN. *Proc. Am. Soc. Testing Materials* 20, II, 398-407(1921).—Machines are considered in which the ductility is detd. from the load necessary to produce cupping.

V. O. HOMERBERG

A new method for determining the malleability of metals and alloys. P. LUDWIK. *Stahl u. Eisen* 40, 1547-51(1920).—This is a modification of the Brinell hardness method. The ball is pressed into the metal near the edge. The ductility is calcd. from the amt. of deformation. Formulas are given.

CARLE R. HAYWARD

Resistance of metals and alloys to pressure. A. POMP. *Z. Ver. deut. Ing.* 64, 745-6(1920).—The tests were carried out on cylindrical test bars 10 mm. in diam. and 20 mm. high in a 15-ton Amsler machine operated by elec. power. The following metals were tested: Pb, compressed; Pb-Sn alloys with 2% Sn, compressed; Cu of com. purity, drawn and annealed; brass with 62% Cu, drawn and annealed; Al, drawn and annealed; mild steel with 0.06% C, drawn and annealed; steel with 0.5% C, drawn and annealed. The results are tabulated and a diagram is given. Pb showed the least resistance to pressure; a load of 405 kg. compresses it from 20 mm. to 10 mm. in height. With 2% Sn the resistance to pressure is slightly increased; shortening to 10 mm. is obtained by a pressure of 630 kg. Al is reduced to 50% of its original height by a pressure of 2910 kg. To produce the same reduction on Cu 5200 kg. pressure is required.

Up to 8000 kg. mild steel offers a higher resistance than brass; with a heavier load this is reversed. To produce a reduction of 3 mm. with brass a pressure of 4070 kg. is required; with mild steel a similar reduction requires a pressure of 4600 kg. Inversely, with mild steel a reduction of 10 mm. is reached with a pressure of 9800 kg. For the same reduction on brass a pressure of 11,480 kg. is required. For steel with 0.5% C the same reduction is obtained with a pressure of 13,050 kg. No rupture was observed with any of the brass tested. In a separate table the resistances to rupture and to pressure loads are given in kg. and in percentages referred to steel as a unit of 100%. The resistances to rupture in kg. per sq. mm. for the metals and alloys are as follows: 0.5% C steel, annealed, 54 kg.; brass, annealed, 46 kg.; mild steel, annealed, 38.5 kg.; Cu, annealed, 22 kg.; Al, annealed, 10 kg.; Pb-Sn alloy (3% Sn), 2.4 kg.; Pb, pressed, 2.2 kg.

C. P. KARR

**Effect of temperature, deformation, grain size and rate of loading on mechanical properties of metals.** W. P. SYKES. *Trans. Am. Inst. Mining Met. Eng.* No. 1032, reprint, 35 pp.(1921).—Evidence has been produced to establish the types of curves that represent variation in tensile strength, elongation, and reduction of area with variation in temp. for all metals. These basic curves are subject to variations produced by any allotropic change that may take place in the metal under consideration. Excluding allotropic changes and other specific characteristics, all metals possess the same fundamental properties and those exhibited by any one metal are functions of the temp. at which the observations are made. The max. reduction of area by fracture in tension occurs in a piece of metal in which single grains occupy the entire cross-section. In the case of 2 aggregates, the one of smaller grain size suffers the greater reduction. The ultimate result of decreasing temp. is a complete loss of ductility and probably eventually a reduction in tensile strength. Brittleness is first observed in metals having equiaxed structures. The smaller the grain size of a sample the lower is the temp. to which ductility is preserved. Deformation of a metal below its annealing temp. makes its max. ductility at any temp. below that of working less than that of the same metal in the unworked condition. But the worked sample will retain its power of elongation to a lower temp.

V. O. HOMERBERG

**Satisfactory etching reagents.** ANON. *Chem. Met. Eng.* 24, 207(1921).—A list is given of the common reagents for etching metals and alloys before microscopic examn., with brief remarks as to the suitability of each and the various features that are revealed.

V. O. HOMERBERG

**Metallographic etching reagents. I. For copper.** HENRY S. RAWDON AND MARJORIE G. LORENTZ. *Bur. Standards, Sci. Papers* No. 399, 641-68(1920).—Two general types of etching, designated as "plain" and "contrast," as defined by the characteristic appearance of the etched surface are described. In general, "contrast" etching is most suitable for microexamn. at relatively low magnifications; for the study of those features of structure for which high magnifications must be used, the plain uncontrasted etched surface is desired. Oxidation is, in general, of fundamental importance in the soln. of Cu and consequently in the etching of this metal. Many solns. that have a very slight etching action upon Cu may be made to etch readily by passing O through them, but solns. that have no solvent action upon Cu can not be made to etch the metal by the addition of O.  $\text{NH}_4\text{OH}$  in the absence of O has an almost negligible action upon Cu. Most of the etching solns. in general use consist of an oxidizer in an acid or an ammoniacal soln. A few very powerful oxidizing agents may be used in soln. without the addition of either  $\text{NH}_4\text{OH}$  or acid. As a rule, aqueous solns. are best for the etching of Cu; in a very limited number of cases, however, alcoholic solns. appear to give better results. Typical etching reagents are described and micrographs are given to illustrate the characteristic features of each.

V. O. HOMERBERG

**New method of testing galvanized coatings.** ALLERTON S. CUSHMAN. *Proc.*



*Am. Soc. Testing Materials* 20, II, 411-25(1921).—A description is given of the apparatus and the method of operation, whereby the H from a known area of any surface is measured. Results of tests on the galvanized coating on corrugated sheets and on a corrugated culvert are given in tables. V. O. HOMERBERG

[Alloys.] C. T. HEYCOCK. Brit. Assoc. Advanc. Sci., *Rept. of 88th Meeting, Cardiff, 1920*, 50-60.—Address of the president of the Chem. Section reviewing the development and present status of our knowledge of alloys. E. J. C.

Report of Committee B-2 on non-ferrous metals and alloys. WM. CAMPBELL, *et al.* *Proc. Am. Soc. Testing Materials* 20, I, 234-50(1921).—Tentative specifications and nomenclature of non-ferrous alloys are given. V. O. HOMERBERG

The present importance of aluminium alloys. ANON. *Z. Metallkunde* 12, 381-6 (1920).—A summary, much of it in tabular form, of the chem. compn., physical properties and industrial uses of 25 alloys of Al with a more detailed discussion of the properties of duralumin. R. S. W.

Influence of small amounts of aluminium on the properties of brass. II. J. CZOCHRALESKI. *Z. Metallkunde* 12, 409-10(1920).—Mechanical tests on a series of brasses with varying small amts. of Al show that when the percentage does not exceed 0.06% no harmful effects are noticed either as regards physical properties or color of the brass. When 0.09% Al is present there is a marked decrease in tensile strength and a great drop in ductility. R. S. W.

Fatigue and impact fatigue tests of aluminium alloys. W. A. GIBSON. *Proc. Am. Soc. Testing Materials* 20, II, 115-36(1921).—A sharp distinction should be drawn between fatigue tests made upon materials as cast and those as forged. In cast Al alloys, the properties are very much affected by the care taken in molding, melting and pouring. On account of the high shrinkage of these alloys this care is much more necessary than with ferrous castings. In the forged materials the ferrous alloys of either C or Ni steel are much superior to the Al alloys when the comparison is made vol. for vol. When the comparison is made on the basis of wt. for wt., the Al alloys are equal if not superior to the ferrous alloys. There is a possibility that in the impact fatigue tests at stresses usually encountered in machine parts, the forged Al alloys might surpass certain types of steel even when the comparison is made vol. for vol. V. O. HOMERBERG

The mechanism of solidification of a copper-aluminium alloy. JUNIUS DAVID ENWARDS. *Chem. Met. Eng.* 24, 217-20(1921).—The density of a series of Cu-Al alloys has been detd. for the solid metal at 20° and for the liquid metal at temps. ranging from the freezing point to 1000°. By the employment of the expansion data for the solid metal and by several methods of interpolation the density of any alloy containing between 0 and 60% Cu can be estd. with a fair degree of accuracy for temps. from 20° to 1000°. These data taken together with the thermal equil. diagram for the system Cu-Al furnish information regarding the vol. changes occurring in the Cu-Al alloys during freezing. They are discussed with particular reference to the 8% Cu alloy and furnish a very reasonable explanation of piping, segregation, etc., as observed with No. 12 alloy. V. O. HOMERBERG

Nickel-chromium alloys. LEON O. HART. *Trans. Am. Inst. Mining Met. Eng.* Preprint No. 1031, 12 pp.(1920).—The physical characteristics and a general discussion are given of *nichrome*, *nichrome II*, which is intended for high duty work, and *kromore*, an alloy containing 85% Ni and 15% Cr. V. O. HOMERBERG

The compounds  $\text{Cu}_3\text{Sb}_2$ ,  $\text{Cu}_2\text{Sb}$  and  $\text{CuSb}$  in the copper-antimony system. H. REDMANN. *Z. Metallkunde* 12, 321-31(1920).—R. has reinvestigated the Cu-Sb system with especial reference to the liquidus curves and to the compn. of the inter-metallic compds. He believes the max. to correspond to  $\text{Cu}_3\text{Sb}_2$  instead of to  $\text{Cu}_2\text{Sb}$  as had been generally accepted. This compd. decomposes into a eutectoid at about

480°. The compd.  $\text{Cu}_3\text{Sb}$  is formed from the solid soln. of Sb in  $\text{Cu}_3\text{Sb}$ , but the equil. conditions have not been detd. It is possible that  $\text{Cu}_3\text{Sb}$  undergoes decomp. into a solid soln. at lower temps. The equil. curves in the Cu-rich section were so close together that the existence of  $\text{Cu}_3\text{Sb}$  or compds. still richer in Cu could not be established.

R. S. WILLIAMS

**Monel metal.** PAUL D. MÉRICA. *Chem. Met. Eng.* 24, 291-4(1921).—The physical properties, microstructure, commercial uses and applications of Monel metal are discussed. Two of its most important properties are its resistance to corrosion and its strength at high temps.

V. O. HOMERBERG

**Casting copper melted in iron cupola.** T. F. JENNINGS. *Foundry* 48, 946(1920).—In casting copper the molds should be dry and porous. In charging a cupola for a copper melt a layer of charcoal was charged on top of the coke bed and the whole metal charge was added, followed by a layer of charcoal. This arrangement prevented the metal from absorbing sulfur from the coke. About 1/4%  $\text{CaCl}_2$  and a generous layer of charcoal were put in the bottom of the preheated ladle immediately before the furnace was tapped. A deoxidizer consisting of 0.006% Zn, 0.006% Sn, and 0.0034% boron product was added to the ladle of metal before pouring. A deoxidizer consisting of 1% phosphor copper may be used instead of the above.

A. W. OWENS

**Causes of piping in aluminium ingots.** JUNIUS DAVID EDWARDS AND HAROLD T. GAMMON. *Chem. Met. Eng.* 24, 338-40(1921).—A method of detg. the piping effect in metals is described, and the results of measurements on a series of Cu-Al alloys are given. It is shown that although the solidification shrinkage of a metal is responsible for the formation of the pipe, it is not necessarily proportional to it. The good casting properties of the 8% Cu alloy are not to be ascribed to a low solidification shrinkage (which it does not possess), but to the manner in which it freezes.

V. O. H.

**Chemical properties and metallography of nickel.** PAUL D. MÉRICA. *Chem. Met. Eng.* 24, 197-200(1921).—M.'s third article (cf. *C. A.* 15, 653-4) dealing with the properties of Ni discusses soly. and the effects of common impurities such as C, O, Mn, S, Co, Fe and Si on the various physical properties.

S. D. KIRKPATRICK

**Some types of non-ferrous corrosion.** H. S. RAWDON. *Trans. Am. Electrochem. Soc.* 41, preprint(1921).—Although fundamentally similar, the author discusses structural changes caused by corrosion of non-ferrous metals as four distinct types, namely (a) selective attack of certain constituents; (b) intercryst. brittleness; (c) internal oxidation; (d) simultaneous action of stress and corrosion. As examples of each type the following are given: (Type a)—Brass (60% Cu, 40% Zn) was exposed to sea water for 7 yrs. The  $\alpha$  constituent (65% Cu) was untouched, while the  $\beta$  constituent (50% Cu) was corroded by a leaching out of the Zn. (Type b)—Cable sheath of Pb exposed underground became brittle owing to the destruction of the intercrystalline material (usually non-miscible impurities such as Fe, Cu, Ni, Zn, or miscible eutectic-forming elements as Sn or Sb). This type of corrosion can be induced by immersion in lead acetate solution. (Type c)—Boiler safety plugs of Sn deteriorated by change of metal to infusible oxide under influence of moist heat. The same type of change is found with Al-Zn (15%) alloys. In this case moist heat causes the oxidation and swelling of the eutectic matrix. (Type d)—Brass and lead under combined stress and corrosion will fall far below normal stress. This is due to selective corrosion of the  $\beta$  constituent (in the former), and to intercryst. brittleness in the latter.

CHAS. H. ELDRIDGE

**Report of Sub-committee III on inspection of the Fort Sheridan, Pittsburgh and Annapolis tests.** J. H. GIBBONEY, et al. *Proc. Am. Soc. Testing Materials* 20, 1, 148-228(1921).—Tables are given of the results of inspection of the corrosion of uncoated test sheets of Fe and steel. A table is also given comparing the corrosion of Cu-bearing with non-Cu-bearing materials.

V. O. HOMERBERG

**The effect of air and water on materials used in engineering work.** H. E. YER-

BURY. *J. Inst. Elec. Eng. (London)* 57, 118-33(1920).—A detailed survey. See C. A. 13, 1442.

The corrosion of steel ranges. OLIVER W. STOREY. *Trans. Am. Electrochem. Soc.* 39, (preprint).—The effect of corrosion on the various parts of steel kitchen ranges was studied. "Armco" and charcoal iron, although highly resistant to atmospheric corrosion, did not withstand flue gas corrosion to the same degree. The addition of Cu to steel increased its resistivity considerably, the increase in resistance being a straight-line function of the copper percentage. The soln. of the problem lies in the use of alloy steels, protective methods, vitreous enameling, and in improvements in design.

D. I. GAGNE

Defects in steel and their detection. J. H. ANDREW. *J. West Scotland Iron Steel Inst.* 28, 28-35(1921).—The importance of physical detns. and their direct application to works practice are illustrated. The micro-examn., macro printing, thermal curves, dilatation detns., resistivity measurements and magnetic testing are discussed in some detail. A simple instrument for detg. dilatation is given in a diagram.

V. O. HOMERBERG

Shattered zones in certain steel rails, with notes on the interior origin of transverse fissures. J. E. HOWARD. *Proc. Am. Soc. Testing Materials* 20, 11, 44-69(1921).—Shattered zones are interior manifestations, being surrounded with walls of unshattered metal. The shattering cracks in rails are located along the middle of the head and at the junction of the web and the base. The cracks themselves are of appreciable size in 2 directions but in their third dimension are very minute. The min. distance separating their walls is probably much less than 0.00002 in. No foreign inclusion is contained in the cracks. They both follow grain boundaries and pass through the grains of the steel. They are not associated with other structural defects, nor are they peculiar to segregated areas, except insofar as they are prevalent in the harder grades of steel. As the result of a great number of observations it was found that softer grades of steel are free from shattered metal. The shattering cracks appear to be of thermal origin; that is, they are cooling or shrinkage cracks. They are acquired presumably after the last pass in the rail mill. The bot-sawed ends of rails have been found unshattered. The cracks occupy zones in the section of the rails which upon cooling acquire a state of initial tension, and have not been found in those parts that are left in a final state of compression. Exptl. treatment has shown a susceptibility to display similar cracks in rails direct from the hot saw, not displayed when reheated after cooling. In steel tires, the disposition, size and orientation of the cracks are even more suggestive of a thermal origin than those in rails. H. discusses also the origin of transverse fissures.

V. O. HOMERBERG

Fibrous fractures in steel. E. H. SCHULZ AND J. COEREL. *Stahl u. Eisen* 40, 1479-85(1920).—Segregation slag inclusions and blow holes are causes of this type of structure but there are other causes not definitely detd. CARLE R. HAYWARD.

The importance of annealing of steel castings. P. OBERHOFFER AND F. WEISGERBER. *Stahl u. Eisen* 40, 1433-42(1920). CARLE R. HAYWARD

Contribution to the knowledge of the so-called double-carbide-bearing chrometungsten steels. P. OBERHOFFER AND K. DAEVES. *Stahl u. Eisen* 40, 1515-6(1920).—The max. soly. of C in Fe which is fixed at 1.7% in the Fe-C diagram is greatly lowered by additions of Cr or W. With C the lowering is rapid at first, reaching 0.75% with 3% Cr, then slower, reaching 0.1% with 14% Cr. The curve for W is similar but the falling off in soly. is slightly more marked. In studying the hardening effect of Cr it was found that the martensitic structure of a 0.12% C and 13 to 17% Cr steel could be changed to pearlite by cooling from 1300° to 50° over a period of 35 hrs. In Cr steels with 0.3-0.5% C and 15-20% Cr polished surfaces remained bright after beating for 18 hrs. at 800° in an oxidizing atm. and etching could be produced only by using an elec. current.

CARLE R. HAYWARD

**Critical heat treatment after critical cold work in low-carbon steel.** A. POMR. *Stahl u. Eisen* 40, 1261-9, 1308-78, 1403-15(1920).—Numerous tests are described and the results shown in tables and graphs. The conclusions to be drawn are that if low-carbon steel is rolled at temps. between room temp. and the  $A_1$  point reducing the cross section 8-16% and subsequently annealed between 650° and 850° a marked grain growth occurs. This is accompanied by a decrease in hardness, elastic limit, breaking load and shock fracture. Ductility is increased.

CARLE R. HAYWARD

**The dimensional limitation of successive heat-treatments of carbon steel.** W. P. WOOD. *Chem. Met. Eng.* 24, 345-6(1921).—The effect of heat-treatment upon the length of C steel sections is the result of 3 influences—the allotropic change in the Fe, the soln. and dissociation of the carbides and the more rapid contraction of the outer portions of steel objects upon quenching. The net result upon the length of the piece is the algebraic sum of changes in length caused by these 3 factors. The hypo-eutectoid steels appear to shrink more rapidly than the others, and thus it would not seem advisable to repeat heat-treatments as often upon these steels as might be possible with precisely machined eutectoid and hyper-eutectoid steels.

V. O. HOMERBERG

**Effect of machining and of cross-section on the tensile properties of malleable cast iron.** H. A. SCHWARTZ. *Proc. Am. Soc. Testing Materials* 20, 11, 70-9(1921).—Decarbonization has a favorable influence upon the strength and ductility of the product. The effect of quick cooling in freezing on the surface metal of a casting is such as to improve the strength and ductility of the product. Roughness of surface of a cast specimen apparently decreases the strength and especially the ductility. The ultimate strength decreases with increasing diameter of section by an amt. proportional to the cube of the diameter. The elongation decreases by an amt. proportional to the 2.5th power of the diameter. The combined effect of all 3 of the preceding variables on strength amounts to about 7000 lb. per sq. in. for sections  $1/4$  in. in diameter or less, and becomes negligible at diameters of  $1 1/4$  in. or over. The combined effect on elongation is about 3% for small specimens and negligible for diameters over  $1/4$  in. The yield point was apparently not affected by any of the variables investigated.

V. O. HOMERBERG

**Nitrogen and case-hardening.** HENRY FAY. *Chem. Met. Eng.* 24, 289-90(1921).

—Several of the results given in the theses of Hurum and Sawyer are discussed. Hurum found that the method of Grabe and Petren would give all of the nitride N. A round bar of low-carbon steel was heated in a cyanide bath for 10 min. at 830° and allowed to cool in the air. Successive layers  $1/100$  in. in thickness were turned from this bar and analyzed for C and N. The following results were obtained from 4 successive layers: C, 0.16, 0.30, 0.06, 0.15%; N, 0.57, 0.201, 0.155, 0.027%. The outside layer contains 0.57% N although the sample was heated for only 10 min. Sawyer carried out an expt. to compare the observed increase in wt. of thin sheet Fe when heated in cyanide with the increase of wt. as calculated from the results of an analysis for C and N. The original analysis of the sheet Fe showed 0.05% C and 0.005% N. Four pieces of this sheet Fe, about 5 g. each, were cleaned, dried and weighed, then heated in NaCN at 830° for 2 hrs., quenched in  $H_2O$ , then washed, dried and weighed. The av. increase in wt. was 2.42%. The analysis of mixed sample from the 4 pieces showed 1.63% C and 0.726% N. The percentage increase in wt. accounted for by the C-N analysis amounted to 97.6%. This result seems to show that the reaction is essentially a carbonizing and nitrogenizing process. An expt. in which specimens were treated by Shimer's cyanamide process brought out the facts that diffusion of C takes place below  $A_1$ , viz., 650°, that N combines with Fe and also diffuses below  $A_1$ , and that the N content decreases with the rise in temp., indicating that equil. is reached at some lower temp.  $NH_3$  reacts readily with Fe to form nitride. This nitride is capable of being held in solid soln. A round bar treated with  $NH_3$  under pressure showed an austenitic structure on its outer surface after quenching. At a short depth the structure is martensitic and further in

is found free the Fe nitride. The formation of this nitride-austenite offers a probable explanation of the ease and rapidity with which steels are case-hardened in cyanide. The introduction of N in case-hardening is beneficial up to certain limits as it adds strength and hardness.

V. O. HOMERBERG

Steel castings of high strength and toughness. FEDERICO GIOLITTI. *Chem. Met. Eng.* 24, 113-8, 161-5(1921).—Data are given on the improvement to be expected after properly heat-treating steel castings, with illustrative tests on strong tough castings which have replaced forgings on gun mounts.

V. O. HOMERBERG

Chain cable and some of its physical properties. C. G. LUTTS. *Proc. Am. Soc. Testing Materials* 20, II, 80-103(1921).—The material used, the different manufacturing steps and the heat treatment of power-forged chain are described. The breaking tests and proving are also considered. Several tables of the physical properties and a complete discussion of each are given.

V. O. HOMERBERG

The influence of nickel and cobalt on the physical and chemical properties of cast iron. O. BAUER AND E. PIWOWARSKY. *Stahl u. Eisen* 40, 1300-2(1920).—Additions of Ni were made up to 1.98%. The sepn. of graphite was promoted, the transverse strength was increased a max. of 30%, the crushing strength 30% and the tensile strength 25%. The hardness decreased 18%. The soly. in acids decreased slightly but apparently the increased graphite counteracts the normal effect of the Ni. Cobalt has an opposite effect. It promotes carbide formation with consequent lowering of the strength and ductility.

CARLE R. HAYWARD

Bluing and browning steel articles. SIDNEY CORNELL. *Chem. Met. Eng.* 24, 301-4(1921). A brief description is given of several commercial methods of producing an oxidized finish on polished steel objects, including analyses of several browning solns. in use in various establishments.

V. O. HOMERBERG

Finish of metallic materials. SIDNEY CORNELL. *Chem. Met. Eng.* 24, 209-12(1921).—The importance of the finish of metallic materials in modern manuf. is discussed. The discussion includes the action of cleaners, polishing, sandblasting, pickling, electrolytic pickling, lacquering, japanning, oiling, slushing, and wrapping.

V. O. HOMERBERG

Arc welding equipment in the foundry. W. W. REDDIE. *Elec. J.* 18, 96-8(1921); 10 illus.

C. G. F.

The development of magnetic materials (YENSEN) 4. Sampling at the Garfield smelter (PARSONS) 7. Methods of ore sampling in Montana (PULSIFER) 7.

IMANURA, JIN-ICHI AND KOGA, ENZÔ: Tokushu-ko to Tanso-ko (Special and Carbon Steels). Tokyo: Maruzen Co. 6 yen.

Treating fine ores and slimes. DANIEL S. MCAFEE. *Can.* 209,324, Mar. 8, 1921. Fine ores are sintered and slimes are added to the hot sintered product simultaneously to dry the slimes and quench the product.

Separating the constituents of an ore by flotation. MINERALS SEPARATION, LTD. Ger. 322,087, Feb. 7, 1914. Air is introduced into the lower vigorously stirred portion of the mass of ore in such limited amts. that in the upper relatively more quiet portion only the ore particles of greater adhesive properties attach themselves to the gas bubbles and are removed in the form of froth. The remaining portions of the ore mass are then treated in like manner with the employment of larger quantities of air, whereby the metallic ore particles attach themselves to the gas bubbles and are recovered in froth form, such particles having less adhesive properties for the gas bubbles. In the treatment of slimes of complex sulfide ores which contain, e. g., galena and Zn blende, it is necessary to treat the ore particles at the ordinary temp. without the employment of

addendum with the addition of a small amt. of eucalyptus oil. The amt. of air employed is so limited that only the galena is floated. The ore mass is then treated with the addition of further amts. of oil and increased air supply, in order to separate the blende. The ore mass may also be treated first without a frothing agent, in which case the soln. must be acidified.

**Concentrating ores.** MINERAL SEPARATION, LTD. Brit. 154,870, Mar. 9, 1920. In a froth flotation process for concg. ores, particularly oxidized ores of Cu, Pb, etc., the ore is suspended in  $H_2O$  to which is added a minimum proportion of oleic acid or its near homologs, and a minimum proportion of Na silicate, with or without  $Na_2CO_3$ ,  $NaOH$  or other alkali, and agitation and aeration are effected as usual. The oleic acid or the like may be added at the stage of wet-grinding as described in 18,937, 1913. The concentrate may be retreated with the addition of more Na silicate but without further addition of oleic acid, etc. The app. used may be such as that described in 18,987, 1913.

**Mineral selective and frothing agent and producing and using same.** R. LUCKENBACH. Can. 208,211, Feb. 1, 1921. Resinous substances may be used collectively or individually and may or may not be mixed with oleic acid or alkali or both as a frothing and selective agent. The agent is mixed with the pulp, the mixt. treated and the froth removed.

**Treating ores.** CARL S. FOGH. Can. 209,985, Mar. 9, 1921. A moving body of ore is heated, then subdivided into various portions which may be delivered at different points along the line of movement of the ore. The required quantity of air is introduced to each of the distributed ore portions and the exit gases may be re-introduced into the furnace to control reactions and regulate the temp. App. is also specified.

**Treating mixed sulfide ores.** E. LANGGUTH. Can. 209,092, Mar. 1, 1921. Sulfide ores are treated with molten  $ZnCl_2$  to convert the Ag and Pb sulfides to chlorides, and sufficient Zn is added to the melt to reduce the Ag and only part of the Pb. This Ag and Pb are sepd. from the melt and the resultant mass is poured into water, from which the Pb may be extd. by adding Zn.

**Desulfurizing metal sulfides.** ARTHUR B. FOSTER. Can. 209,203, Mar. 8, 1921. Metal sulfides are maintained at a temp. above incipient redness in intimate contact with gases containing  $SO_2$  until the major part of the  $SO_2$  is reduced. The  $SO_2$  may be produced by roasting part of the ore in suitable furnaces.

**Reducing ores and oxygen compounds.** FRANS M. WIBERG. Can. 209,503, Mar. 15, 1921. Ore is treated in a furnace with a countercurrent of  $CO$ ; before the reducing capacity of the  $CO$  is wholly utilized, part of it is withdrawn, regenerated and again introduced as a reducing gas. The remaining part of the  $CO$  is permitted to act on the whole mass of ore at a temp. suitable for the reduction and produced by the combustion of combustible constituents remaining in the portion of the gas after it has finished its reducing action.

**Chloridizing ores.** W. A. SCHMIDT. U. S. 1,368,973, Feb. 15. Ores such as those of Cu are heated in a roasting furnace with superposed hearths and treated at successive stages with  $NaCl$  or other chloride which will effect chloridizing of the ore and volatilization of the chloride formed. The latter is elec. pptd. or otherwise collected.

**Ore-sintering mechanism.** JNO. KNOX. Can. 209,878, Mar. 29, 1921. The app. comprises a series of ore-carrying pallets supported upon an elongated upwardly inclined support, means for causing air to pass through the ore, an inclined support along which the pallets are automatically returned to the initial end of the support and power-actuated lifting means, the two inclined supporting tracks being substantially parallel.

**Pair heating furnaces and method of operating the same.** THOS. J. COSTELLO. Can. 209,838, Mar. 29, 1921. Sheet or tin plate bars are heated by piling the bars in

packs extending transversely of the heating chamber, spacing means are placed between adjacent packs and the packs are pushed through the heating chamber while subject to the action of the heating medium. The furnace is also specified.

Precipitating precious metals with charcoal. K. B. MOORE and H. R. EDWARDS. U. S., 1,368,520, Feb. 15. Solns. containing precious metals, *e. g.*, solns. obtained from Au ores, are passed through finely ground charcoal in a series of extractor units while charcoal is passed through the series in the opposite direction and reverse order and fresh charcoal is fed into the end of the series. The charcoal effects absorption of the Au from the soln. and is subsequently burned for recovery of Au from the residue.

Production of tungsten powder directly from sodium and potassium tungstates. CASIMIR J. HRADEK. Can. 208,990, Mar. 1, 1921. Na tungstate 100 parts,  $\text{NH}_4\text{Cl}$  87.01 and charcoal 13.73 parts are mixed together, gradually heated to 1000–1150° and the tungsten is sepd. from the resultant mass.

Roasting of zinc sulfide ores preparatory to leaching. HERBERT WM. GAY. Can. 209,091, Mar. 1, 1921. Zinc sulfide ores are rapidly roasted at a relatively high temp. until the sulfide S content is reduced to 6–10%, then slowly roasted at a lower temp. in the presence of an excess of air until the insol. Zn compds. are converted into sol. Zn compds. An oxide of Fe may be added to promote the conversion of  $\text{SO}_2$  to  $\text{SO}_3$  for the formation of  $\text{ZnSO}_4$ .

Recovering zinc from calamine, especially from poor zinc ores and residues. J. J. BOGUSKI and AKT.-GES. FÜR BERGBAU UND HÜTTENBETRIEB. Ger. 321,242, Apr. 1, 1913. Addition to 271,658 (C. A. 8, 2337). The principal process is modified by conducting superheated steam into strong  $\text{Zn-NH}_3$  lyes, obtained by treating the Zn ores with strong solns. of  $\text{NH}_3$  or its derivs., and contained in a heated vessel. The purpose of this modified treatment is to sep. the Zn salt in cryst. form. The resulting ppt., consisting chiefly of  $\text{Zn(OH)}_2$ , settles in a short time to the bottom of the vessel, while the weakened ammoniacal supernatant liquid becomes clear and can be sepd. readily from the ppt. by decantation or otherwise. After the strong  $\text{Zn-NH}_3$  liquor is freed from the greater portion of its Zn content by pouring into hot  $\text{H}_2\text{O}$  and introduction of superheated steam, the residual  $\text{Zn-NH}_3$  liquor can be subjected for the second time to the same process in order completely to sep. any Zn still contained therein.

Utilizing the ash from the zinc distillation process. SCHLESISCHE AKT.-GES. FÜR BERGBAU- UND ZINKHÜTTENBETRIEB. Ger. 321,526, Nov. 7, 1913. After each distn. and reduction the ash is collected in pockets under the muffles, and the heat contained therein is utilized by blowing with air or with a current of gas directly for pre-heating the new charge of the muffle. The strong heat upon the outer walls of the retorts is claimed to be moderated thereby, the entire charge is heated to the reduction temp. in a short time, the C retained in the ash and the heat also are utilized and the liquid metal present is conducted by the blast direct to the new charge which serves as a filter.

Roasting copper ores. PERCY R. MIDDLETON. Can. 209,380, Mar. 8, 1921. Sulfide ores are heated with access of air to a temp. below the ignition point of S; this temp. is maintained until a max. amt. of the sulfide has been converted to sulfate, then increased to about 1200° F., whereby the Fe sulfate is changed to oxide and the Cu sulfide oxidized to sulfate.

Extracting copper from ores. R. H. BRADFORD. U. S. 1,368,885, Feb. 15. Cu ore is mixed with such a proportion of  $\text{CaCl}_2$  or  $\text{NaCl}$  as to produce  $\text{CuCl}_2$  by reaction with the Cu of the ore and the mixt. is heated to about 800° to convert substantially the entire quantity of the Cu of the ore into  $\text{CuCl}_2$ . The latter is volatilized and collected in the dry state, mixed with  $\text{CaO}$  and C and heated to a temp. somewhat above the m. p. of Cu to obtain metallic Cu and regenerate  $\text{CaCl}_2$  for further use in the process.

Freeing metals from copper. M. O. SEM. Can. 209,964, Mar. 29, 1921. Iron

containing Cu and Si is heated to 1450° with an Fe sulfide which reacts with the metallic Cu present forming Cu sulfide and metallic Fe which sulfide is then sepd.

**Protecting blast furnace tuyères and the like.** GKR. SCHUSS. Ger. 321,033, July 28, 1918. Addition to 319,938 (C. A. 15, 497). The principal process is improved by treating the surfaces of the castings as well as the contiguous inner surfaces with preparations consisting of fluorides or metallic or mineral substances. E. g., Zn dust or ZnO is brought into contact with the Fe surfaces the pores of which are penetrated, with resulting protection against dropping molten Fe.

**Coating metals.** BRITISH THOMSON-HOUSTON CO. Brit. 154,808, Dec. 31, 1919. Metals are coated with Al to render them unoxidizable at high temps. by pickling in HCl, immersing in concd. ZnCl<sub>2</sub> soln., dipping in a molten easily fusible metal capable of alloying with Al and the metal under treatment, such as Zn or Sn, for about 15 seconds to form a coating, then dipping in a bath of molten Al or an alloy of Al, for example 1 part of Sn and 3-8 parts of Al by wt., for about 30 secs., and, finally, after shaking to remove any adherent metal, heating to a temp. sufficiently high to volatilize the Zn or Sn and to cause penetration and alloyage of the Al with the metal to be treated. When Fe is treated with Al the final firing should be carried out at about 800° for about 15 mins. The invention provides a modification of the process described in 3,752, 1912 (C. A. 7, 2516 and 9,097, 1913 (C. A. 8, 3287)).

**Treating iron ores; metallic oxides; obtaining nickel.** MOA IRON & DEVELOPMENT CORPORATION. Brit. 155,246, Nov. 30, 1920. The soft Fe ores of the north of Cuba and similar ores containing oxides or oxides and silicates of Fe and Al and small quantities of Ni, Mn, and Cr, are dried and preheated and then roasted in contact with SO<sub>2</sub> under sulfatizing conditions and then leached with H<sub>2</sub>O to obtain a soln. of the sulfates of the Al and other metals, leaving residue consisting of a purified Fe ore. The sulfate soln. is preferably reduced, for instance by Fe or SO<sub>2</sub>, to minimize the quantity of Fe that will accompany the Al in the subsequent pptn., and is treated with CaCl<sub>2</sub> to convert the sulfates into chlorides, and the pptd. CaSO<sub>4</sub> is sepd. The chloride soln. is treated with the requisite quantity of CaCO<sub>3</sub> or the like to ppt. the Al, Fe<sup>III</sup>, and Cr. The ppt. is sepd. and treated for the recovery of Al<sub>2</sub>O<sub>3</sub> by Bayer's process, the residue being treated for the recovery of the Cr or it may be "sintered with the ore." The soln. is then treated with air and CaCO<sub>3</sub> to oxidize the remaining Fe and ppt. it as Fe(OH)<sub>3</sub>, only the necessary quantity of CaCO<sub>3</sub> being employed. The filtrate is treated with CaO to ppt. Ni and Mn hydroxides. The ppt. is washed and dissolved in H<sub>2</sub>SO<sub>4</sub>, the soln. being then electrolyzed with an insol. anode and a Ni cathode so as to obtain metallic Ni and MnO<sub>2</sub>. Each electrode may be inclosed in a diaphragm, for instance a canvas bag, the mixed hydroxides being introduced into the bath outside the diaphragms, or into a sep. vessel between which and the electrolytic cell the soln. circulates. A soln. containing Fe and Ni, with or without other metals, may be treated with CaO or other reagent to ppt. all the metals as hydroxides and the ppt. smelted to obtain an Fe-Ni alloy, any Mn present being slagged off if desired. Any desired proportion of the Fe could be pptd. as above described and removed before the pptn. of the mixed hydroxides.

**Puddled iron.** J. E. FLETCHER. Brit. 155,042, Sept. 7, 1919. In a plant for the manuf. of puddled Fe comprizing an open-hearth furnace for preliminary refining, a series of puddling-furnaces, together with steam hammers, shingling presses, and rolling mills, pulverized fuel is used for heating the furnaces and for raising part of the steam required; and the rest of the steam is raised by the waste furnace gases. The charge may consist of solid or molten pig iron with or without Fe and steel scrap, and the fuel used may be coal with or without an admixt. of oil.

**Iron composition.** GRO. G. MARK. Can. 209,887, Mar. 29, 1921. Iron is produced by melting pig iron, scrap iron and a clay product such as crushed fire brick.



**Direct production of wrought iron, steel or cast iron.** LUCIEN P. BASSAT. *Can.* 209,172, Mar. 8, 1921. Iron ore, coal and flux are introduced at the upper extremity of a rotary furnace, which is heated by introducing at the other extremity a finely divided fuel with superheated air so that combustion will produce chiefly CO.

**Introducing silicon into iron or steel.** J. DUCHESNE. *Ger.* 305,106, Oct. 6, 1917. Known silicates and a basic compd., such as sand and lime, are incorporated with the molten stream of metal, in the presence of C, in the manner customary for the introduction of C.

**Removing impurities and gases from molten iron or steel.** G. J. BOYLE VISCOUNT CHETWYNN. *Ger.* 321,034, Jan. 9, 1914. The process is applied to Fe or steel which has been withdrawn from a Siemens-Martin furnace or other melting, pretreating or purifying furnace into a suitable container, in which the molten metal is subjected to the action of an elec. current. A current of high amp. is passed through the bath while the latter is highly heated from the bottom to produce a high state of fluidity. The product is said to be superior, and inexpensive.

**Heat-treating and compressing ingots.** F. C. GASCHER. *U. S.* 1,368,332, Feb. 15, 1921. The pat. relates to molding and subsequent compressing and heating of steel ingots to prepare them for rolling into homogeneous forms.

**Powder for packing incandescent iron and steel parts.** H. BEHRENS. *Ger.* 324,825, Nov. 21, 1919. A packing to prevent cooling and oxidation of incandescent Fe and steel is composed of sawdust 500, charcoal 250, slaked lime 100, asbestos 100 and potash 50 parts, all powdered and intimately mixed dry.

**Open-hearth steel.** HERBERT C. RYDING and ANSON W. ALLEN. *Can.* 209,160, Mar. 1, 1921. Basic open-hearth steel is made from all blown metal by charging the open-hearth first with low-C, molten blown metal and then with lime and iron oxide, heating until the bath and slag are in proper condition, adding high-C molten blown metal and finishing the operation.

**Stable surface alloy steel.** PERCY A. E. ARMSTRONG. *Can.* 206,587, Dec. 21, 1920. An alloy steel consists of Cr over 10%, C over 0.05, Si over twice the percentage of C, Cr and Si together being over 13%, and the principal portion of the remainder Fe.

**Plating with steel.** H. HANEMANN. *Ger.* 326,106, Dec. 23, 1919. The surface of the ground metal is covered with an air hardening steel.

**Preparing iron surfaces to be metallized.** FRANKONIA-AGT.-GES. VORM METALL-AROM-GES. M. B. H. *Ger.* 320,686, Oct. 18, 1918. The articles to be coated, after being allowed to rust superficially, are heated, before being treated, to a temp. of at least 100°, in order to remove gases enclosed in the surface or chemically combined. The rusting of the articles may be effected by leaving them for a long time in moist chambers, or by coating them with a rust-producing salt soln. such as  $\text{NH}_4\text{Cl}$ . Before the heating the articles may be etched, whereby the coating of rust is removed, the surfaces, however, remaining sufficiently rough to insure firm adhesion of the coating.

**Alloys.** GES. FÜR WOLFRAM-INDUSTRIE. *Brit.* 154,937, Dec. 7, 1920. A hard alloy suitable for wire-drawing dies and other tools consists of 50-60% of W, 30-40% of Fe, and smaller amts. of Ti, C, and preferably Ce. In some cases 1-5% of Cr, preferably in the form of Fe-Cr, may replace part of the Fe. Cf. C. A. 15, 824.

**Alloys.** ALADAR PACZ. *Can.* 209,696, Mar. 22, 1921. A fine-grained, ductile alloy containing 8-15% Si and the balance mostly Al is made by stirring into the molten bath an alkaline fluoride.


**Metal alloy.** E. FLUGEL. *Can.* 207,038, Dec. 28, 1920. Brass or bronze is made more suitable for bearings, etc., by the addition of up to 34% Zn, 3% Al, 5 Sn, 3 Pb, subject to a variation in the alloy of 30% of any individual metal.

**Resistance alloy.** JNO. H. WHITE. *Can.* 200,342, Mar. 8, 1921. An alloy used in resistance elements contains Ni 75, Fe 11, and Ta-Ch 14%.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROULLER

**Modification and extension of the Friedel and Crafts reaction.** JNANENDRA NATH RAY, *J. Chem. Soc.* 117, 1335-9 (1920).—When excess of  $\text{HgCl}_2$  was mixed with Al and an aromatic hydrocarbon, a complex product was obtained, e. g.,  $\text{C}_6\text{H}_6 + \text{Al} + 2\text{HgCl}_2 \rightarrow \text{C}_6\text{H}_5\text{AlCl}_2\text{HgCl} + \text{Hg}$ , which in the F. and C. reaction showed increased activity over  $\text{AlCl}_3$  alone and even caused in many cases the formation of different products. To 20 cc. of dried  $\text{C}_6\text{H}_6$  and 2 g.  $\text{HgCl}_2$  in a flask with a reflux condenser attached, 1 g. of Al powder was gradually added with shaking. The heat of reaction caused boiling and occasional cooling was advisable; a green mass sepd. and the reaction was finally completed by leaving it in warm water for 0.5 hr. The Hg formed was now removed. To the catalyst was added gradually (2 hrs.) one mol.  $\text{AcCl}$ , the mixt. was allowed to stand, then heated 1 hr., finally decompd. with  $\text{H}_2\text{O}$ , extd. with  $\text{C}_6\text{H}_6$  and distd.;  $\text{PhCOMe}$  in 80% yield was obtained. From 33 cc.  $\text{PhMe}$ , 25 g. Al, 45 g.  $\text{HgCl}_2$ , and  $\text{AcCl}$  was obtained 16.1 g. *p*- $\text{MeC}_6\text{H}_4\text{Ac}$ . On addition of 10 g. of flowers of S to the catalyst from 45 g.  $\text{HgCl}_2$ , 2.5 g. Al and 30 cc.  $\text{C}_6\text{H}_6$ , heating on a  $\text{H}_2\text{O}$  bath till  $\text{H}_2\text{S}$  was gone, decompn. with ice, filtration of the residue and extn.

of it with  $\text{CHCl}_3$ , *thianthrene*,  $\text{C}_6\text{H}_4$    $\text{C}_6\text{H}_4$ , was formed, crystals from  $\text{Me}_2\text{CO}$ , m.

160°. 9,10-Diphenyl-9,10-dihydroanthracene (A) was made from 1 g.  $\text{AlCl}_3$ , 20 g.  $\text{HgCl}_2$ , 15 cc.  $\text{C}_6\text{H}_6$  by the slow addition of 6 cc.  $\text{CHCl}_3$ , allowing the mixt. to stand 2 hrs., then heating 2 hrs. at 40-50°, decomp. and filtering; from the filtrate by evapn. of the  $\text{C}_6\text{H}_6$ , a residue was obtained which when purified, first by treating with hot  $\text{HOAc}$  containing a little  $\text{H}_2\text{O}$ , then repeated crystns. from dil.  $\text{EtOH}$  and dil.  $\text{Me}_2\text{CO}$ , m. 150° (*Am. Chem. J.* 13, 556 (1891), gives 164°). A was also made from the catalyst and  $\text{PhCHCl}_2$ ; the constitution of A was proved by treating A with  $\text{CrO}_3$  in  $\text{HOAc}$  and obtaining anthraquinone. *Diacetyl-9,10-diphenyl-9,10-dihydroanthracene*, crystals from dil.  $\text{EtOH}$ , m. 92°, was produced from A by  $\text{Ac}_2\text{O}$  and 4 drops  $\text{C}_6\text{H}_5\text{N}$ . By the same general method already described for A, *dimethyl-9,10-ditolyl-9,10-dihydroanthracene* was formed from Al,  $\text{HgCl}_2$ ,  $\text{PhMe}$ , and  $\text{CHCl}_3$ , crystals from dil.  $\text{HOAc}$ , m. 215°; *dimethyl-9,10-diphenyl-9,10-dihydroanthracene*, from Al,  $\text{HgCl}_2$ ,  $\text{PhMe}$  and  $\text{PhCHCl}_2$ , crystals from  $\text{HOAc}$ , m. 185°; *9,9,10,10-tetraphenyl-9,10-dihydroanthracene*, from Al,  $\text{HgCl}_2$ ,  $\text{C}_6\text{H}_6$  and  $\text{CCl}_4$  or from Al,  $\text{HgCl}_2$ ,  $\text{C}_6\text{H}_6$ ,  $\text{PhCCl}_2$ , crystd. from dil.  $\text{Me}_2\text{CO}$ , m. 159°; *ω-nitrotriphenylmethane*, from Al,  $\text{HgCl}_2$ ,  $\text{C}_6\text{H}_6$ , and  $\text{CCl}_4\text{NO}_2$ , crystd. from  $\text{EtOH}$ , m. 145° (decompn.).

ROGER ADAMS

**Constitution of carbamides. XIII. Constitution of cyanic acid and formation of urea from interaction of ammonia and cyanic acid at low temperatures.** EMIL ALPHONSE WERNER and WILLIAM ROBERT FEARON. *J. Chem. Soc.* 117, 1356-62 (1920).—The constitution of cyanic acid (A) is indicated by (a) its polymerization, and (b) its hydrolysis and behavior toward  $\text{NH}_3$  at low temps. W. assumes that A is an equil.

mixt. whether in static condition or in soln., thus,  $\text{HOCN} \xrightleftharpoons[\text{by fall in t.}]{\text{by rise in t.}} \text{HNCO}$  and also

that the keto form polymerizes to cyanuric acid (B) and the enol form to cyamelide (C). Expts. on the polymerization of liquid A (made by heating dry B) at various temps. showed on analysis of the product that with increase in temp. the proportion of B increased regularly and that of C decreased, indicating that with increase in temp. the equil. of the keto and enol forms of A shifted toward the keto form. W. believes that urea (D) whenever formed in a reaction where  $\text{NH}_3$  and A are concerned, is produced not merely by rearrangement of  $\text{NH}_4\text{OCN}$ , but chiefly by direct union of  $\text{NH}_3$  with A.

In this reaction  $\beta$  changes are involved: primary changes (1)  $(\text{HOCN} \rightleftharpoons \text{HNCO}) + \text{H}_2\text{O} = \text{CO}_2 + \text{NH}_3$ ; (2)  $\text{HOCN} + \text{NH}_3 = \text{NH}_4\text{OCN}$ ; (3)  $\text{HNCO} + \text{NH}_3 =$



: secondary changes; (4)  $\text{NH}_3 + \text{CO}_2 + \text{H}_2\text{O} = \text{NH}_4\text{HCO}_3$ ; (5) biuret

from D and HNCO; (6) production of C. The reaction (3) of this series was proved by allowing a 0.25 N soln. of A (produced from  $\text{HNO}_3$  and pure  $\text{KOCN}$  at  $0^\circ$ ) to hydrolyze at  $0^\circ$  and detg. A and D during increasing periods of time from 15 to 1230 mins. In 90 mins. all the A had disappeared, after which time any D was assumed to form merely by hydrolysis of  $\text{NH}_4\text{OCN}$  and recombination of the  $\text{NH}_3$  and A produced. During the first 90 mins., 10 times as much D formed as in the period 90 to 1230 mins. From data obtained, W. calcd. that A must be at  $0^\circ$  a mixt. of 60% enol and 40% keto, which agreed with his polymerization expts. In these expts. W. estimated A by pptg. with excess  $\text{AgNO}_3$ , dissolving in  $\text{HNO}_3$  and then titrating by the Volhard method; D was estd. in the filtrate by any one of the usual methods, after it had been made alk. with  $\text{CaO}$  and freed from  $\text{NH}_3$ . In using xanthydrol (E) for the estimation of D, a salt of D must be present to get the best results—thus a satd. aq. soln. of D (made by adding 0.13 g. of E in 2 cc. of  $\text{EtOH}$  to 1 l. of boiling  $\text{H}_2\text{O}$ , cooling, filtering if necessary), was added in the proportion of not less than 6 to 1 to an aq. soln. of D containing a few drops of  $\text{HCl}$ ; thus 1 part of D in 10,000 was revealed in 15 secs., 1 part to 800,000 in 10 mins.

ROGER ADAMS

Formation and reactions of imino compounds. XX. The condensation of aldehydes with cyanoacetamide. JAMES N. E. DAY AND JOCELYN F. THORPE. *J. Chem. Soc.* 117, 1465-74 (1920).—In the condensation of ketones with  $\text{CNCH}_2\text{CONH}_2$ , it has been previously shown (*C. A.* 5, 2848; 8, 490) that the products consist of 2 types of heterocyclic 6-membered systems which can be easily hydrolyzed to yield  $\beta$ , $\beta$ -disubstitution products of glutaric acid. Two mols. of  $\text{CNCH}_2\text{CONH}_2$  condense with aliphatic aldehydes in the presence of a trace of alkali hydroxide, to give products of a type different from the preceding, being insol. in dil. mineral acids, not forming chloroplatinates, not hydrolyzable to imino compds., but quickly and completely hydrolyzed to  $\beta$ -monosubstituted glutaric acids by dil.  $\text{HCl}$ . There is probably a greater tendency to form other (6-membered ring) types of condensation products when 2 alkyl groups are attached to the central C atom, as in ketones, than when only 1 substituent group is in this position. But physical properties (soly.) may det. the order and amt. of formation. The normal open-chain compd. may be first formed in all cases, but if its soly. is high, a less sol. ring form may result from it. In the present investigation about 99% of the products were of the normal open-chain type. By mixing 25.2 g. of  $\text{CNCH}_2\text{CONH}_2$  in 126 cc. of  $\text{H}_2\text{O}$  with 6.6 g. of  $\text{AcH}$  and 0.3 cc. of 50% aq.  $\text{KOH}$ , ppta. begins after 10 mins. and is complete after 3 hrs., giving a 95% yield of white cryst.  $\alpha,\alpha'$ -dicyano- $\beta$ -methylglutaramide, too insol. to be recrystd., hence ground with dil.  $\text{HCl}$  and washed with hot abs.  $\text{EtOH}$ , m.  $161^\circ$ . Hydrolysis with concd.  $\text{HCl}$  gives an almost quant. yield of  $\beta$ -methylglutamic acid, very pure, m.  $87^\circ$  after recrystn. from  $\text{C}_6\text{H}_6$  or dil.  $\text{HCl}$ . The  $\text{HCl}$  washings from the amide gave 0.25% of 6-imino-3-cyano-5-carbamyl-4-methyl-2-piperidone after treatment with  $\text{AcONa}$  soln., small prisms from  $\text{H}_2\text{O}$ , m. (decompn.)  $235^\circ$ , also yielding  $\beta$ -methylglutamic acid on hydrolysis by  $\text{H}_2\text{SO}_4$ , but changed to 3-cyano-2,6-diketo-4-methylpiperidine-5-carboxylamide by hot dil.  $\text{HCl}$ , colorless prisms from  $\text{H}_2\text{O}$ , m. (decompn.)  $245^\circ$ . The original filtrate from these condensation products, on mixing with  $1/2$  its vol. of concd.  $\text{HCl}$ , gives a cryst. ppt. of 3,5-dicyano-2,6-dihydroxy-4-methylpyridine, m.  $252^\circ$ , described by Quenda (*Atti accad. sci. Torino* 32, 415). Similar treatment of  $\text{EtCHO}$ , and purification of the crude product by grinding with  $\text{HCl}$  and recrystn. from alc.  $\text{C}_6\text{H}_6$  gave colorless needles of  $\alpha,\alpha'$ -dicyano- $\beta$ -ethylglutaramide, sparingly sol., m.  $147^\circ$ , converted into  $\beta$ -ethylglutamic acid

by 5 hrs. boiling with dil. HCl. Aq. AcONa ppts. from the HCl washings of the main product about 0.5% of 6-imino-3-cyano-5-carbamyl-4-ethyl-2-piperidone, m. (decompn.) 214°, changed by boiling with HCl into 3-cyano-2,6-diketo-4-ethylpiperidine-5-carboxylamide, m. 288°; both the latter give  $\beta$ -ethylglutaric acid on hydrolysis. A 90% yield of  $\alpha,\alpha'$ -dicyano- $\beta$ -propylglutaramide is obtained from PrCHO; white microcryst. powder, m. 136°, insol. in HCl, but completely hydrolyzed by boiling with it to  $\beta$ -propylglutaric acid, small needles, m. 52°, freely sol. in most org. solvents and H<sub>2</sub>O; silver salt, white, amorphous powder; anhydride, from the amide by the action of AcCl, colorless mobile liquid, b<sub>10</sub> 180°; semianilide, from the anhydride and PhNH<sub>2</sub> in C<sub>6</sub>H<sub>6</sub>, small colorless plates, m. 128°; diethyl ester, colorless oil, b<sub>10</sub> 132°. The HCl washings from the amide, on treatment with AcONa, gave 6-imino-3-cyano-5-carbamyl-4-propyl-2-piperidone, m. 208° (decompn.); changed by boiling with dil. HCl to 3-cyano-2,6-diketo-4-propylpiperidine-5-carboxylamide, m. 229°. By the action of 25 g. of CNCH<sub>2</sub>CONH<sub>2</sub> in 126 cc. of H<sub>2</sub>O on 16 g. of BzH in 90 cc. of EtOH, with a little KOH, after 3 days at 38–40° extn. with Et<sub>2</sub>O gave a solid, which, recrystd. from EtOH, formed needles m. 129–30°, and was identical with  $\alpha$ -cyano- $\beta$ -phenylpropionamide. The aq. soln. after extn. with Et<sub>2</sub>O and acidifying with HCl, gave a white ppt. of 3,5-dicyano-6-hydroxy-4-phenyl- $\Delta^{3,4}$ -dihydro-2-pyridone, m. 245°, originally prepd. by Guareschi (*Atti accad. sci. Torino*, 34, 565). From the same reaction mixt. without EtOH,  $\alpha$ -cyanocinnamamide, was pptd., silky needles from C<sub>6</sub>H<sub>6</sub>, m. 123°. By seeding the reaction mixt. containing EtOH with a crystal of the unsatd. amide, an 80% yield of the same product,  $\alpha$ -cyanocinnamamide, in pure form, is obtained in 2 hrs. M. R. SCHMIDT

The melting point of heptane and the law of alternance of melting points. R. DE FORCRAND, *Compt. rend.* 172, 31–4 (1921).—From a comparison of the m. ps. of the methane hydrocarbons (CH<sub>4</sub>–C<sub>24</sub>H<sub>50</sub>), F. points out that the law of alternance of m. p. holds for this series as well as for the fatty acid series and others. By assuming that this law applies to any series of compds., F. has calcd. the m. p. of cyclobutane should be –50° and the m. p. of the unknown silicanes, Si<sub>4</sub>H<sub>12</sub> and Si<sub>6</sub>H<sub>14</sub>, should be –83° and –98°, resp. Heptane, prepd. by the method of Grignard, m. –94.5° or –95°. A redetn. of other constns. gave b<sub>760</sub> 98.8°, d<sub>4</sub><sup>20</sup> 0.7010. The m. p. of octane was found to be –57.4° instead of –58.2°, as reported by Guttman (*C. A.* 1, 1843).

CARL S. MARVEL

Properties and constitution of the group—OCCl<sub>3</sub>. ANDRÉ KLING AND DANIEL FLORENTIN, *Compt. rend.* 172, 63–6 (1921).—The authors suggest that the abnormal reactions of compds. containing the —OCCl<sub>3</sub> group may be explained by assuming a tautomeric form containing quadrivalent oxygen: R.O.CCl<sub>3</sub>  $\rightarrow$  R.OCl:CCl<sub>2</sub> or R—O:CCl<sub>2</sub>. The mol. refraction and mol. dispersion of several compds. of this

type furnish no conclusive evidence of this tautomerism. Values for M<sub>a</sub>, M<sub>v</sub>, and M<sub>v</sub> – M<sub>a</sub> are given as follows: ClCO<sub>2</sub>CH<sub>2</sub>Cl, 22.66, 23.37, 0.71; ClCO<sub>2</sub>CHCl<sub>2</sub>, 27.63, 28.40, 0.77; ClCO<sub>2</sub>CCl<sub>3</sub>, 32.54, 33.44, 0.90. CARL S. MARVEL

Crystals of the thioanhydride of bornylxanthic acid. M. K. ELYASHEVICH, *Ann. école mines Oural* 1, 120–8 (1919).—Drawings and detailed description of (C<sub>10</sub>H<sub>17</sub>OCS)<sub>2</sub>S which had been prepd. by Chugaev (in or before 1909). H. M. GORDIN

The interaction of thioacid chlorides and aliphatic diazo compounds. H. STAUDINGER AND JOS. SIEGWART, Zurich, *Helvetica Chim. Acta* 3, 840–52 (1920).— $\alpha,\alpha'$ -Diphenyl- $\beta$ -dichloroethylene sulfide (A), prepd. by adding slowly 1 mol. PhSCl (B) in petr. ether to a well cooled soln. of 1 mol. Ph<sub>2</sub>CN<sub>2</sub> in petr. ether, crystals from petr. ether or EtOH, m. 89–90°, quant. decomp. at 160° into Ph<sub>2</sub>C:CCl<sub>2</sub> (C) m. 80°, and S. A remains unchanged after boiling a short time in MeOH; prolonged boiling yields C; hot PhNH<sub>2</sub> or Zn in Et<sub>2</sub>O has no action on A, although Zn

without a solvent yields C; agitation with Hg in cold Et<sub>2</sub>O or PhH has no action on **D**. *Diphenylenedichloroethylene sulfide* (D), from (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CN<sub>2</sub> and B in petr. ether, crystals from CS<sub>2</sub>-petr. ether, m. 97° (yield, almost quant.), decomps. into (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>C<sub>2</sub>Cl<sub>2</sub> (E) and S on fusion, when kept for 8 days in a desiccator, on boiling in PhH or glacial AcOH or on recrystn. from CS<sub>2</sub>; a MeOH/Et<sub>2</sub>O soln. of aniline reacts with D to form E with only a trace of Cl<sub>2</sub> being removed; Zn reacts with D in the same way. A recrystd. from glacial AcOH or MeOH forms yellow needles, m. 129-30°. *5,5-Dichloro-3,4-diphenyl-Δ<sup>2</sup>-1,2-thioxole* (F), PhC:CPb.CCl<sub>2</sub>S.O, prepd. by adding 20 g. PhBzCN<sub>2</sub> in 200 cc. abs.

Et<sub>2</sub>O to 11 g. B in 50 cc. abs. Et<sub>2</sub>O, cooling (avoiding all traces of H<sub>2</sub>O), letting stand a day, filtering and crystg. from petr. ether, m. 55-7°, is very sensitive to H<sub>2</sub>O, forming *3,4-diphenyl-Δ<sup>2</sup>-1,2-thioxole-5-one* (G), PhC:CPb.CO.S.O, m. 76-8°, which is also prepd.

in the same manner as F without first isolating F but adding aq. MeOH, then removing the solvent by distn. and recrystg. from MeOH. G is a stable compd. which is decompd. by HNO<sub>3</sub> forming Bz<sub>2</sub>; when heated with alc. KOH, PbCH<sub>3</sub>COPb is formed. *3,4-Diphenyl-5-phenylimino-Δ<sup>2</sup>-1,2-thioxole*, PhC:CPb.O.S.C:NPh, obtained in low yield

by adding PhNH<sub>3</sub> to F, m. 129-30°. *Triphenylchloroethylene sulfide* (H), Ph<sub>3</sub>C—CClPh,

S

from B and Ph<sub>3</sub>CN<sub>2</sub> in petr. ether, crystals from ether + petr. ether, m. 70-1°. When H is heated to 100°, Cl<sub>2</sub> is evolved and α,β-diphenylbenzothiophene (I) (?), m. 114-5°, is formed. EtOH converts H into I and a high melting compd. of unknown constitution, which is insol. in EtOH; PhNH<sub>3</sub> liberates HCl from H, forming a compd. m. 184-5° of unknown constitution, which contains S but no Cl or N. *Diphenylenephenylchloroethylene sulfide* (J), prepd. in the usual manner from (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>CN<sub>2</sub> and B in abs. Et<sub>2</sub>O, crystals from CS<sub>2</sub> + petr. ether, m. 125-6°. *Diphenylenephenylchloroethylene* (K), formed when J is heated 2 hrs. at 150-80°, m. 119-20°. Cold EtOH or MeOH has no action upon J, but on boiling the solns. for several hrs. HCl is evolved and a yellow product of unknown constitution is formed which is insol. in EtOH; recrystd. from EtOAc, it m. 237-8°; analysis shows C<sub>10</sub>H<sub>10</sub>S. N<sub>2</sub>CHCO<sub>2</sub>Et and B react in cold petr. ether, forming *methyl 5-phenyl-1,3,4-thiodiazole-2-carboxylate*, PhC:N.N:C(CO<sub>2</sub>Me).S

(cf. Wolff, *Ann.* 333, 1(1904)), crystals from MeOH, m. 102°. N. A. LANGE

Dehydrogenation of alcohols by catalytic oxidation. CHARLES MOUREU AND GEORGES MIGNONAC. *Bull. soc. chim.* 29, 88-101(1921).—See C. A. 15, 235.

E. H.

Primary-quaternary bases. S. GABRIEL. Univ. Berlin. *Ber.* 53B, 1985-93 (1920).—When 50 g. C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>Br and 30 cc. dry C<sub>6</sub>H<sub>5</sub>N are heated on the H<sub>2</sub>O bath under a reflux there first results a clear soln., which begins to solidify after about 10 min.; after 2 hrs. the cryst. mass is washed free of C<sub>6</sub>H<sub>5</sub>N with Et<sub>2</sub>O and crystd. from alc., giving β-phthalimidoethylpyridylum bromide (A), C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>N-(C<sub>5</sub>H<sub>5</sub>)Br, leaves and flat needles, sinters about 230°, m. about 235°. *Dichromate*, (C<sub>6</sub>H<sub>4</sub>O<sub>2</sub>N<sub>2</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, orange-red-yellow needles. *Picrate*, C<sub>6</sub>H<sub>4</sub>O<sub>2</sub>N<sub>2</sub>.C<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>, long needles, m. 198°. If the bromide in H<sub>2</sub>O is treated with Ag<sub>2</sub>O, AgBr seps. and the soln. transiently becomes strongly alk. but after filtering it soon becomes neutral, especially on warming, and on concn. yields a sirup which finally solidifies radially; the product (B) is neutral, exceedingly sol. in H<sub>2</sub>O and seps. from a little hot alc. in leaflets and needles, sinters 140°, m. about 190° (decompn.). From its compn. (C 65.46, H 5.37, N 10.52), it is evidently produced by replacement of the Br by OH and at the moment of its formation it doubtless has the structure of a quaternary ammonium base, but

probably  $\text{H}_2\text{O}$  is first added with formation of an aminic acid,  $\text{C}_6\text{H}_5\text{N}(\text{OH})\text{CH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{H}$ , and then split off between the HO and  $\text{CO}_2\text{H}$  groups, so that the final product has a betaine-like structure. It dissolves in a little HCl with evolution of heat and then a chloride (C),  $\text{C}_6\text{H}_5\text{NClCH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{H} \cdot 2\text{H}_2\text{O}$ , sepa. in 6-sided leaflets and short prisms, loses its  $\text{H}_2\text{O}$  at  $100^\circ$ , sinters  $178^\circ$ , m.  $180-1^\circ$ . *Picrate*,  $\text{C}_6\text{H}_5\text{N}[\text{OC}_6\text{H}_4(\text{NO}_2)_2]\text{CH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{H}$ , from B or the above chloride and 1% picric acid, granules, needles and tables, sinters about  $153^\circ$ , m.  $159-60^\circ$  (decompn.). *Bromide*, from 0.4 g. B, 0.4 g. of 50% HBr and 5 cc. abs. alc., needles with  $2\text{H}_2\text{O}$ , sinters  $80^\circ$ , m.  $65^\circ$ . When B is heated with MeBr in MeOH at  $100^\circ$ , there is apparently first formed an ester  $\text{C}_6\text{H}_5\text{NBrCH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{Me}$ , but it at once loses MeOH and forms A; with MeI under the same conditions is obtained  $\beta$ -phthalimidoethylpyridylum iodide, quadratic leaflets from MeOH, m. about  $239-40^\circ$ , also obtained by heating  $\text{C}_6\text{H}_5\text{N}$  with  $\text{C}_6\text{H}_4(\text{CO})_2\text{NCH}_2\text{CH}_2\text{I}$  (which m.  $99-100^\circ$ , not  $84^\circ$  as given in *Chem. Zentr.* 1905, II, 1754). *Chloride*, from anhydrous C heated *in vacuo* at  $210^\circ$ , or from  $\text{C}_6\text{H}_4(\text{CO})_2\text{NCH}_2\text{CH}_2\text{Cl}$  and  $\text{C}_6\text{H}_5\text{N}$  heated 2 hrs. at  $170^\circ$ , rhombic crystals from EtOH-AcOEt (apparently with EtOH of crystn.), m. about  $134^\circ$ , become opaque at  $100^\circ$  and then m.  $222-3^\circ$ . A warmed with 1 mol. of N NaOH, concd. and allowed to stand overnight, yields short prisms or rhombic tables apparently of a salt  $\text{C}_6\text{H}_5\text{NBrCH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{Na} \cdot 2\text{H}_2\text{O}$ . B boiled 5 hrs. under a reflux with 5 parts of 20% HCl gives phthalic acid and  $\beta$ -aminoethylpyridylum chloride hydrochloride (D), 4- and 3-sided plates from alc., m.  $208-10^\circ$ , gives with  $\text{Ag}_2\text{O}$  a strongly alk. soln., which attacks the skin and on evapn. over  $\text{H}_2\text{SO}_4$  or on the  $\text{H}_2\text{O}$  bath forms a black resin; an aq. soln. of the salt yields with concd. KOH no oil nor basic odor and on warming turns yellow and finally brown-black. *Bromide hydrobromide* (V), from 1 g. A boiled 1.5 hrs. under a reflux with 4 cc. HBr (d. 1.49), long needles or elongated rhombs from MeOH, sinters  $195^\circ$ , m.  $206-8^\circ$ . *Picrate*,  $\text{C}_7\text{H}_{10}\text{N}_3\cdot 2\text{C}_6\text{H}_5\text{O}_7\text{N}_3$ , powder of flat rectangular needles, sinters about  $215^\circ$ , m. about  $225-6^\circ$  (decompn.). *Chloroplatinate*, orange-yellow needles, m. about  $264^\circ$ . The free base, like pyridinecholine, probably has the structure  $\text{C}_6\text{H}_5\text{N}.\text{CH}_2\text{CH}_2\text{O}$ ; D heated in  $\text{H}_2\text{O}$  with  $\text{Ba}(\text{NO}_3)_2$  gives 14.40% N (calcd. for

the equation  $\text{C}_6\text{H}_5\text{N}_3\text{Cl}_4 + \text{HNO}_3 = \text{C}_7\text{H}_{10}\text{ONCl} + \text{H}_2\text{O} + \text{N}_2 + \text{HCl}$ , 14.36%); the resulting soln. gives, through the chloroplatinate, a picrate, long striated flat needles, m.  $101-2^\circ$ , identical with that prepd. from pyridinecholine chloride, sinters  $114^\circ$ , m.  $125-6^\circ$ , made from  $\text{C}_6\text{H}_5\text{N}$  and  $\text{ClCH}_2\text{CH}_2\text{OH}$ ; *chloroaurate*,  $\text{C}_7\text{H}_{10}\text{ONCl}_2\text{Au}$ , yellow eaflets, m.  $115-6^\circ$ . E heated 2 hrs. with Sn and HCl, made alk. and distd. with steam gives *N*- $\beta$ -aminoethylpiperidine, isolated as the picrate, m.  $214-5^\circ$  (decompn.). From 5 g.  $\text{C}_6\text{H}_4(\text{CO})_2\text{CH}_2\text{CH}_2\text{Br}$  and 5 cc. of 33% alc. NMe<sub>3</sub> heated with 7.5 cc. alc. 2 hrs. at  $100^\circ$  is obtained  $\beta$ -phthalimidoethyltrimethylammonium bromide, leaflets, m.  $262-3^\circ$ ; *iodide* (F), similarly prepd., silvery scales from  $\text{H}_2\text{O}$ , m.  $276^\circ$ ; *picrate*, long needles, m.  $186-7^\circ$ ; *chloride* (G), from the iodide and AgCl, leaflets from alc., sinters about  $250^\circ$ , n.  $270^\circ$  (foaming); *chloroaurate*, yellow microcryst. powder. When the chloride or bromide is shaken in  $\text{H}_2\text{O}$  with  $\text{Ag}_2\text{O}$  and the alk. soln. is evapd., it becomes neutral and leaves a cryst. crust sepg. from EtOH-AcOEt in silky needles, very sol. in  $\text{H}_2\text{O}$ , n.  $258-9^\circ$ , of the compn.  $\text{C}_{10}\text{H}_{13}\text{O}_3\text{N}_3$ , which doubtless have the betaine structure. *Picrate*,  $\text{C}_{10}\text{H}_{13}\text{O}_3\text{N}_3 \cdot \text{C}_6\text{H}_5\text{O}_7\text{N}_3 \cdot \text{H}_2\text{O}$ , short columns, sinters about  $103^\circ$ , m.  $144^\circ$ . *Iodide*,  $\text{Me}_3\text{NICH}_2\text{CH}_2\text{NHCOC}_6\text{H}_5\text{CO}_2\text{H}$ , rhombs, melts with foaming when plunged into a bath at about  $280^\circ$  and resolidifies, being converted into F. G boiled 2 hrs. under a reflux with 4 parts of HCl gives  $\beta$ -aminoethyltrimethylammonium chloride hydrochloride (choline chloride hydrochloride), rhombohedron-like crystals from MeOH, m.  $254^\circ$  (foaming); *chloroplatinate*, orange-yellow leaflets, m. about  $245^\circ$ ; *picrate*, branching needles, m.  $212-4^\circ$  (decompn.), has a choline-like physiol. action and is toxic to mammals.

CHAS. A. ROULLIER

**Primary-quaternary bases.** MARGARETHE BOESE. Univ. Berlin. *Ber.* 33B, 1994-9(1920); cf. preceding abstr.— $C_6H_4(CO)_2NCH_2CH_2CH_2Br$  (A) (10 g.) in 5 cc.  $C_6H_5N$  at 100° soon solidifies to  $\gamma$ -phthalimidopropylpyridylum bromide (B), crystals from alc., sinters 214°, m. 218°. *Picrate*, needles, sinters 166°, m. 168°. *Dichromate*, dark yellow tables, decomp. about 200°. *Betaine*,  $C_6H_4N \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot NH \cdot CO \cdot C_6H_4 \cdot CO \cdot O$ .

$H_2O$ , fine needles from abs. alc., m. 86° (charring). *Picrate*, delicate yellow rectangular tables, sinters 135°, m. 139°.  $\gamma$ -Aminopropylpyridylum bromide hydrobromide, from B with  $HBr$ , prisms from  $MeOH$ , m. 176.5–7.5°. *Picrate*, yellow rhombic leaflets from  $H_2O$ , darkens about 200°, m. 206°.  $C_6H_4(CO)_2NCH_2CH_2BrMe$ , prepd. from  $C_6H_4(CO)_2NCH_2CH_2CH_3$ , reacts with  $C_6H_5N$  with much more difficulty than A; only after 3–4 hrs. at 162° does the (equimol.) mixt. partially solidify and on cooling it seps. into 2 layers, the upper consisting of pure yellow crystals of  $C_6H_4(CO)_2NCH_2CHMe$  (C) and the lower of a solid mixt. which is freed from the excess of  $C_6H_5N$  by being allowed to stand 1 day on clay, then extd. with warm  $H_2O$ , which leaves C undissolved and on concn. deposits the very hygroscopic *N*-[8-phthalimidoisopropyl]pyridylum bromide (D), rhombohedrons, from abs. alc., sinters 210°, m. 225°; yield of D about 24%, of C about 30%. *Picrate* (E),  $C_{26}H_{17}O_6N_4$ , long yellow needles, m. 190–1°. *Dichromate*, orange rhombohedrons and prisms, darkens 195°, m. 196° (foaming). The bromide with  $Ag_2O$  yields a *betaine*,  $C_6H_5 \cdot N \cdot CHMe \cdot CH_2 \cdot NH \cdot CO \cdot C_6H_4 \cdot CO \cdot O \cdot H_2O$ , needles from alc., darkens 160°, rh. 185°

(foaming). *Picrate*,  $C_{26}H_{19}O_{10}N_6$ , yellow tables and needles, sinters 146°, m. 149–50° (foaming), converted at 120° into E. The *betaine* (0.2 g.) in 0.2  $HBr$  (d. 1.49) and 3 cc. warm abs. alc. cautiously treated with  $Et_2O$  gives a *salt*,  $C_6H_5NBrCHMeCH_2NH \cdot CO \cdot C_6H_4 \cdot CO \cdot H_2 \cdot 2H_2O$ . *Chloride*, from the *betaine* with a few drops of fuming  $HCl$ , rectangular tables, m. below 100°. D boiled 2 hrs. under a reflux with 4 parts  $HBr$  (d. 1.49) yields phthalic acid and *N*-[aminoisopropyl]pyridylum bromide hydrobromide, rhombs from  $MeOH$ , sinters 227°, m. 233–4°. *Picrate*, yellow scales, darkens 190°, m. 197°. *Chloroplatinate*, orange-yellow needles. C heated on the  $H_2O$  bath with 2 mols.  $KOH$  and some alc. until dissolved, then treated with  $HCl$  to turbidity, yields 1.5 g.  $HO_2CC_6H_4CONHCH_2CHMe$ , needles from  $AcOEt$ , m. 136° (Johnson and Jones, *C. A.* 5, 2071, give 152°; probably they heated their product very slowly so that it passed into C, m. 152°, before melting). *Silver salt*, finely granular. On boiling with  $H_2O$ , the acid decomp. into  $C_6H_4(CO_2H)_2$ ,  $NH_3$  and  $EtCHO$ . C (1 g.) in 10 cc.  $CHCl_3$  treated with  $Cl$  until the soln. smells of it and concd. yields  $\alpha$ -phthalimido- $\alpha$ , $\beta$ -dichloropropane, needles from gasoline, m. 96°; boiled under a reflux with 10 parts  $H_2O$  it yields phthalimide and the distillate reduces Fehling soln.; the hydrolysis, therefore, apparently follows the same course as in the case of the di-Br compd. (Gabriel, *C. A.* 5, 3265) J. and J. did not succeed in adding  $HBr$  to C, but if the finely powdered C is shaken 1.5 hrs. with  $HBr$  (satd. at 0°) it goes over into *N*- $\alpha$ -bromopropylphthalimide, crystals from gasoline, m. 89–90°.

CHAS. A. ROULLIER

Some sulfur derivatives of isopropylamine. MARGARETHE BOESE. Univ. Berlin. *Ber.* 53B, 2000-2(1920); cf. Gabriel and Ohle, *C. A.* 12, 687.—The crude hygroscopic  $MeCHBrCH_2NH_2 \cdot HBr$  (A) prepd. by Uedinc's method (*Ber.* 32, 968(1899)) can be purified by dissolving 40 g. in 30 cc.  $AcOH$ , then adding 60 cc.  $AcOEt$  and 20 cc. abs.  $Et_2O$  with shaking, quickly filtering, adding 40 cc.  $Et_2O$  and rubbing and cooling (protected from moisture), whereupon the snow-white salt ( $\frac{1}{2}$ ) of the crude product seps. and is washed with a mixt. of 1 part  $AcOH$  and 2 parts each of  $AcOEt$  and  $H_2O$ . For the following work, however, the purified has no advantages over the crude A. It is converted by an equiv. amt. of  $N$   $NaOH$  at 50° into  $MeCH.NH.CH_3$  and distd.

with excess of alkali from a Cu still; the base in the distillate is detd. by titration, treated with somewhat more than 1 equiv. of *N* NaOH and  $\text{CS}_2$  and shaken 2 hrs., boiled with much  $\text{H}_2\text{O}$ , filtered and evapd. on the  $\text{H}_2\text{O}$  bath; the resulting oily residue, which finally solidifies, is warmed with dil. KOH and filtered from the viscous insol. matter and the pure  $\text{MeCH.N:C(SH).S.CH}_3$  (E) pptd. with solid  $\text{NH}_4\text{Cl}$ ; yield, 25%. Boiled about

120 hrs. under a reflux with 20 parts of 20% HCl and evapd. on the  $\text{H}_2\text{O}$  bath B gives  $\alpha$ -mercaptoisopropylamine hydrochloride (C), needles from EtOH-AcOEt (1:5), sinters  $90^\circ$ , m.  $94^\circ$ , gives no ppt. with  $\text{HgCl}_2$ . *Picrate*, short prisms, m.  $123^\circ$ . C in  $\text{H}_2\text{O}$  treated with I in KI until the yellow color no longer disappears is oxidized to  $\beta,\beta'$ -diaminodipropyl disulfide, a strongly alk. oil; *dihydrochloride*, needles from EtOH-AcOEt, m.  $212^\circ$ . *Dipicrate*, rectangular plates, sinters  $198^\circ$ , m.  $201^\circ$  (decompn.). *Dibenzoyl derivative*, leaflets, sinters  $157^\circ$ , m.  $170^\circ$ . C (1 g.) heated 20 min. over a free flame with 3 cc.  $\text{BzCl}$ , poured into  $\text{H}_2\text{O}$ , treated with a little HCl, freed from the excess of  $\text{BzCl}$  by distn., made alk. and distd. with steam gives 4-methyl-2-phenylthiazoline, oil with a sharp parsley-like taste. *Picrate*, rhombic plates from alc., sinters  $119^\circ$ , m.  $124^\circ$ . *Dichromate*, orange ppt., decomps. below  $100^\circ$ . CHAS. A. ROULLER

Chemical action of penetrating radium rays—the position of the fumaric-maleic acid equilibrium in the penetrating radium rays and on the action of the latter and of ultra-violet light upon aqueous solutions of urea, benzoic acid and formic acid (KAILAN) 3.

Organic acid derivatives. T. H. DURRANS. Can. 209,554, Mar. 15, 1921. In making org. acid derivs. Cl and  $\text{SO}_2$  are caused to react with a mixt. of alkali acetate and a compd. adapted to promote the reaction such as an ester, ether, aldehyde, etc.

Acetic anhydride. H. DREYFUS. U. S. 1,368,789, Feb. 15.  $\text{SO}_2$  800 parts is introduced into an app. containing dry  $\text{Na}_2\text{SO}_4$  1600 parts and when the absorption of the  $\text{SO}_2$  is completed the product is gradually added, with agitation, to a mixt. of dry pulverized NaOAc 1640 parts and  $\text{Ac}_2\text{O}$  1600 parts. During this addition the materials are cooled to prevent much rise in temp. and then the mixt. is heated to  $60\text{--}70^\circ$  to complete the reaction with production of  $\text{Ac}_2\text{O}$ . The latter is distd. *in vacuo*.

Acetic acid. H. DREYFUS. Brit. 154,680, Aug. 28, 1919. In the manuf. of HOAc by the oxidation of liquid acetaldehyde at  $10\text{--}20^\circ$ , the catalyst employed is the residue which remains after igniting the C from animal charcoal, with or without the addition of NaOAc. As the residue mainly consists of Ca and Mg phosphates, it may be replaced by a mixt. of these compds., with or without small quantities of  $\text{CaO}$ ,  $\text{SiO}_2$  and fluorides.

Aldehyde; acetic acid. A. WOHL. Brit. 154,579, Nov. 4, 1920.  $\text{C}_2\text{H}_2$ , air, and steam are passed over a catalyst at  $300\text{--}400^\circ$  and the resulting aldehyde and HOAc are condensed fractionally, or first oxidized completely to HOAc. The weak aldehyde fraction is used to produce the necessary steam. As catalysts are specified basic metallic salts, particularly vanadates, molybdates and chromates. In an example, basic Zn vanadate is pptd. from alk.  $\text{NH}_4$  vanadate soln. by  $\text{ZnCl}_2$  and deposited on rubbered pumice, the rubber being then burned off in air.

Thiophene derivatives. H. SCHEIBLER. Brit. 155,259, Dec. 11, 1920. Products containing S in the form of thiophene derivs. together with aliphatic and aromatic hydrocarbons are prepd. from bituminous rock oils rich in S. The oils are refluxed with caustic alkali, or soda lime or other mixt. of alkali and alk.-earth hydroxides, distd., washed with dil. acid, dried, and distd. *in vacuo*. To remove the remaining O compds., they are treated with an ethereal soln. of an alkyl Mg halide, the ether is evapd. and the residue treated with acid and then with alkali. By distg. over Na, almost colorless oils having medicinal properties are obtained. From oils thus purified but poor in



thiophene derivs., the latter may be isolated (1) by treatment with Hg salt and subsequently sepg. and decomp. the double compds. formed, (2) as halogen derivs. by halogenation and distn., (3) as acetyl derivs. by treatment with cold AcCl and a limited quantity of AlCl<sub>3</sub>; the semicarbazone of propyl (or isopropyl) acetylthiophene is stated to have been obtained.

**Aromatic amines.** T. S. MOORE. Brit. 155,319, July 14, 1919. The reduction of aromatic nitro, nitroso, or azo compds. is effected by means of cast-Fe borings or turnings and an aq. soln. of a metal chloride, such as Na, Ca, or Fe chloride; the treatment of nitrobenzene, and of nitrophenyl benzyl ethers or their homologs or halogen derivs., is excluded. Examples are given of the reduction of *p*-nitrosophenol to *p*-aminophenol, *o*-nitroaniline to *o*-phenylenediamine, *p*-nitroacetanilide to *p*-aminoacetanilide, and Na *p*-hydroxyazobenzene-*p'*-sulfonate to *p*-aminophenol and Na sulfanilate; *o*-nitrosophenol, *o*- and *p*-nitrophenol, *p*-nitroaniline, *o*-nitroacetanilide, and Na 2-nitro-4-aminobenzenesulfonate also are specified as parent materials.

**Esters of dihydroxydiethyl sulfide.** FARBERWERKE VORM MEISTER, LUCIUS and BRÜNING. Brit. 154,907, Dec. 3, 1920. Dihydroxydiethyl sulfide is heated with an org. acid or acid anhydride and the resulting ester isolated by distn. *in vacuo*. According to examples, the diformyl ester is obtained by using formic acid, and the diacetyl ester by using acetic anhydride, or dil. or glacial HOAc. Esters of other acids such as benzoic or phthalic acids are prepd. by the use of the corresponding acid anhydrides.

## II—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR., AND WILLIAM J. GIES

### A—GENERAL

FRANK P. UNDERHILL

**Chemical phenomena in biology and medicine.** H. SCHWARTZ. *Chimie et industrie* 3, 18-26(1921).—A discussion of chemotherapy on the basis of the Ehrlich side-chain theory.

JEROME ALEXANDER

**Individuality and chemical structure.** H. BIERRY. *Rev. sci.* 58, 685-9(1920).—From the work of many biologists and chemists, B. concludes that differences in the proteins of the blood plasma are responsible for the characteristics of species and of individuals.

JEROME ALEXANDER

**Residual affinity odor theory.** T. H. DURRANS. *Perf. Essent. Oil Rec.* 11, 291-3 (1920).—D. shows by numerous examples that the mols. of odorous compds. have some common inherent characteristic quite apart from questions of soly. or physiol. action, such other characteristic being termed "residual affinity." It is a remarkable fact that odorous compds. frequently give evidence of the possession of free "residual affinity," as for instance the ease with which they form double or addition products, although the property is not confined to such compds. It is possible, and not unlikely, that the chem. reaction which takes place in the nose and gives rise to the sense of odor is an addition reaction (except in the case of sternutatory and similar substances, when the action is destructive). The probable sequence of events in the process of smelling after the substance has reached the nostrils, is first a soln. of that substance in the aq. outer layer, thence passing partially to the lipid fats (the amt. which passes in a given interval being partly dependent on the soly. partition coefficients of the substance in the H<sub>2</sub>O and the lipid fats), and in these fats an addition reaction occurring, causing a change of energy which produces a sensation perceptible to the nervous center—the brain. The particular smell experienced would depend on the velocity, the kind and the no. of addition reactions taking place.

W. O. E.

**Urease.** Contribution to the study of the action of poisons. P. RONA and P. GYRGER. *Biochem. Z.* 111, 115-33(1920).—Extensive tables are given showing the results of the action of various combinations of urease on urea, in the presence of various H-ion concns., phosphate mixts., blood serum, physiol. salt soln., distd. H<sub>2</sub>O, amino acids, a series of org. As compds., and alc. The results indicate that the optimum of the soy-bean urease action is at  $P_H = 7.3 - 7.5$ , a value found by other workers. Blood-serum activation of urease is evident only in prolonged studies. No inhibiting action of H<sub>2</sub>O or NaCl, nor accelerating effect of amino acids could be observed. The action of the As compds. is regularly inhibitory.

F. S. HAMMETT

Correction and supplement to our study "the chemistry of the polysaccharides." E. HERZFELD and R. KLINGER. *Biochem. Z.* 112, 55-60(1920).—Referring to the earlier report (*C. A.* 15, 99) the authors here state that maltose is detectable in significant amts. when starch or dextrin is digested with a diastase prepn., thus retracting the former finding that no sugar is produced under these conditions. Results are presented which indicate that the splitting of some 80% or more of the starch into sugar is the exception, not the rule, since the alc.-sol. sugar is but 10 to 20% of the amt. of starch originally used. When sol. starch, potato starch and glycogen are treated with diastase, it appears as if the amt. of enzyme added is the significant factor and not the type of polysaccharide employed. The conception of the action of diastase on polysaccharides is extended into the idea that not only does this enzyme act as a simple sol. agent in that it changes the substrate into a higher degree of dispersion, but also the acknowledgment is made that the enzyme acts as a hydrolytic splitting agent. The former process is a property of many other chem. compds., such as formalin. The hydrolytic active constituents are complex and very labile and are those on which the fermenting function of the material depends.

F. S. HAMMETT

Color analysis of urine. II. Urochromogen. M. WEISS. *Biochem. Z.* 112, 61-97(1920); cf. *C. A.* 14, 2648.—The urochromogen fraction of the urinary pigments is at most 20% of the total coloring material. The color of urochromogen is a gold-green. This green tint differentiates it from urochrome. The color is extraordinarily dependent on the reaction of the soln. It gives a pure and typical Ehrlich diazo reaction 6 times more sensitive than tyrosine. The high reduction capacity of the compd. differentiates it from the other urinary pigments, particularly those of the red fraction as shown by its action on alk. AgNO<sub>3</sub>. When urochromogen soln. is treated with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, there is immediately formed (in the light and O<sub>2</sub>) a dark ppt. which is similar to uromelanin in its alc. soly. and pptn. by acids. Attempts at isolating urochromogen showed that the compd. is extremely labile and that the product obtained by (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> salting out has just the opposite properties of the original substance. The tests of the compd. lead W. to the conclusion that it is an acid with marked salt-forming proclivities, alc.- and H<sub>2</sub>O-sol., but Et<sub>2</sub>O-insol. On the basis of the xanthoproteic acid reaction and the phenylacetaldehyde test, it is probably to be considered as a phenylalanine deriv., which carries, on the basis of the diazo reaction, at least one OH-group. This is probably in the ortho position on the alanine ring since Millon's reaction is negative and a green color is developed with FeCl<sub>3</sub>. Since the color is deepened with KMnO<sub>4</sub>, and reduction of alk. AgNO<sub>3</sub> occurs, other chromogenous groups are possible. The kidneys are stated to be the place of formation of urochromogen which is considered as a sp. secretion formed from the nuclear residues. F. S. H.

**Fibrinolysis.** M. ROSENMANN. *Biochem. Z.* 112, 98-111(1920).—A study is reported of the effect on fibrinolysis of various salts in various concns. R. was able to ppt. a fibrinolytic substance from the fibrin autolysate. A similarly acting substance was obtained from the press juice of a pneumonic lung. This fibrinolytic substance differs from the leucocytic trypsin by its thermostability, by the fact that it is inactive in a 0.4% Na<sub>2</sub>CO<sub>3</sub> soln., and by the fact that its activity is not related to the

leucocyte count of the fibrin. The exudate from tubercular serositis markedly retards fibrinolysis. Native fibrin is more easily acted upon by concd. salt solns. than by ones that are dil. This effect is demonstrable in a very short time, and is not related to the insol. Ca combinations present. The fibrin autolysis is influenced differently by different salts.

F. S. HAMMETT

**Lipase of pulmonary tissue.** ANDRÉ MAYER AND PIERRE MORHL. *Bull. soc. chim. biol.* 1, 189-207(1919).—Pulmonary tissue contains an enzyme which hydrolyzes esters and glycerides, and has properties different from those of pancreatic lipase.

J. C. S.

**The phosphatides.** ERNEST FOURNEAU. *Bull. soc. chim. biol.* 2, 67-87(1920).—A general discussion of these substances. It appears certain that ordinary "lecithin" is a mixt. of true lecithin and cephalin.

J. C. S.

**The mode of action of chlorine on oxyhemoglobin.** ANDRÉ MAYER AND FRED VILKS. *Bull. soc. chim. biol.* 2, 96-111(1920).—A series of products is formed, which are characterized by their spectra, during the action of Cl on hemoglobin. It is probable that following the inhalation of large doses of Cl the same series of reactions occurs as may be obtained *in vitro*.

J. C. S.

**The classification of the proteins.** PIERRE THOMAS. *Bull. soc. chim. biol.* 2, 112-8(1920).—The existing classifications are reviewed, and the desirability of adhering to a simple and uniform international scheme is emphasized.

J. C. S.

**Synthesis of cyanic acid by oxidation of organic substances.** New methods of analysis of this substance. R. FOSSÉ. Lille. *Ann. inst. Pasteur* 34, 715-62(1920); cf. C. A. 15, 217.—Urea is a product of vegetable as well as animal cells. Plant forms, however, are provided with the enzyme urease, which decomposes urea into  $\text{NH}_3$  and  $\text{CO}_2$ , both readily used by the organism so that N loss does not occur. Urea in very small quantity can be detected and measured by pptn. with xanthidol. By this reagent it can be found in the products of alk. hydrolysis and oxidation of protein, the amt. formed being greater than that which would result from the arginine content of the protein mol. Urea is also formed during the oxidation of carbohydrates by  $\text{KMnO}_4$  in ammoniacal soln., and results from similar treatment of  $\text{HCHO}$  and glycerol. It is formed also when a mixt. of protein and carbohydrate is oxidized, and in considerable quantity, as much as 40 g. per l., when blood and glucose are simultaneously oxidized with  $\text{KMnO}_4$  and the product is heated with  $\text{NH}_4\text{Cl}$ . A ureagenic substance is its precursor in the oxidation of proteins, amino acids, glycerol, formaldehyde, glucose, levulose, sucrose, dextrin, inulin, and starch, which can be converted into urea on heating with  $\text{NH}_4\text{Cl}$  or long standing with it at ordinary temp. This substance can be pptd. as the Ag salt and identified as  $\text{HCNO}$  by cryst. form and color reactions with K plus Co in alc. soln. and with  $\text{NH}_2\text{OH} \cdot \text{HCl}$  and  $\text{FeCl}_3$ , a transient blue-violet being produced in this reaction. It is readily converted into urea on heating with  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$ , but not after treatment with  $\text{HNO}_3$ . For more certain identification F. used quant. methods, treating large amts. of oxidation products with  $\text{AgNO}_3$  and dil.  $\text{HNO}_3$  to neutrality, a ppt. being formed, which was taken up in boiling water and cooled,  $\text{AgCNO}$  crystg. out. Its identification was established by heating with  $\text{NH}_4\text{Cl}$ , the products,  $\text{AgCl}$  and urea, being detd. quant., the latter by the xanthidol method. Urea was produced in greatest amt. in the oxidation of  $\text{HCHO}$  in ammoniacal soln. F. believes  $\text{NH}_3$  and  $\text{HCHO}$  are much more likely precursors of urea than  $\text{NH}_2$  and  $\text{CO}_2$  in the organism and suggests that its formation takes place as follows:  $\text{HCHO} + \text{NH}_3 + \text{O} \longrightarrow \text{CNH} \cdot \text{CNH} + \text{O} \longrightarrow \text{CONH} \cdot \text{CNH} + \text{NH}_3 \longrightarrow \text{CO}(\text{NH}_2)_2$ .

E. R. LONG

**The nature of chlorine combination in urine.** A. T. CAMERON AND M. S. HOLLENBERG. Univ. Manitoba. *J. Biol. Chem.* 44, 239-41(1920).—In the absence of chlorate or similar medication Cl occurs in the urine as chloride only; org. Cl and Cl oxy-acids

are absent. Baumgarten's procedure (C. A. 3, 1412) by which he found from 0.04 to 0.2 g. of org. Cl excreted daily in the urine was repeated with completely negative results.

A. P. LOTHROP

Some amino acids from the globulin of the coconut as determined by the butyl alcohol extraction method of Dakin. CARL O. JOHNS AND D. BRESSE JONES. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 44, 283-90(1920).—The products of the hydrolysis of coconut globulin (C. A. 13, 847) were extd. with *n*-butyl alc. and the amino acids which remained in the aq. soln. detd. The extn. is complete only after 65 hrs. but about 72% of the total amt. is extd. during the first 23 hrs. of the extn. The following %s of amino acids were found in the aq. residue: glutaminic acid 19.07, aspartic acid 5.12, alanine 2.87, serine 1.76. No hydroxyglutaminic acid or glycine could be detected. From the amino acids extd. by the butyl alc. 5.54% of proline and 0.64% of leucylvaline anhydride were isolated. It has not been detd. whether the presence of the leucylvaline anhydride was due to incomplete hydrolysis of the protein or whether it was formed as a secondary product during the extn.

A. P. LOTHROP

Hydrolysis of the globulin of the coconut, *Cocos nucifera*. D. BRESSE JONES AND CARL O. JOHNS: U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 44, 291-301(1920); cf. preceding abst.—The usual order of procedure in the analysis of the hydrolysis products of proteins was modified in the analysis of the coconut globulin in such a way that 78.15% of the products were identified and detd. The order of procedure was as follows: removal of the hexone bases with phosphotungstic acid; sepn. of most of the glutaminic acid as the hydrochloride; pptn. of the remaining dibasic amino-acids as Ca salts; extn. of proline and peptide anhydrides with abs. alc.; esterification of the remaining amino acids by means of the Pb salt method of Foreman; fractional distn. of the esters under reduced pressure; and finally regeneration and isolation of the amino acids in the usual manner. Max. %s of the amino acids obtained are as follows: alanine 4.11, valine 3.57, leucine 5.96, proline 5.54, phenylalanine 2.05, aspartic acid 5.12, glutaminic acid 19.07, serine 1.76, tyrosine 3.18, cystine 1.44, arginine 15.92, lysine 5.80, tryptophan present, leucylvaline anhydride 0.64, NH<sub>3</sub> 1.57; total 78.15.

A. P. LOTHROP

Composition of inositol phosphoric acid of plants. R. J. ANDERSON. N. Y. Agr. Expt. Sta. *J. Biol. Chem.* 44, 429-38(1920).—Data obtained from the analyses of carefully purified and recrystd. Ba salts of the org. P compd. of wheat bran are in close agreement with the calcd. compn. of the Ba salts of inositol hexaphosphoric acid. The results are not only in accord with those previously obtained regarding the compn. of the phytic acid of wheat bran but are also in agreement with the prepn. isolated from cottonseed meal, com. phytin, oats, corn, and maple seed which have been reported from the same lab. The formula of the Ag salts prepd. from the acid was found to be  $C_6H_4O_{14}P_6Ag_{12}$ . The compn. of the phytic acid of plants corresponds to inositol hexaphosphoric acid,  $C_6H_4O_{14}(PO(OH)_2)_6$ .

A. P. LOTHROP

Studies on autolysis. VI. Effect of certain colloids upon autolysis. H. C. BRADLEY AND H. FELSHER. Univ. Wis. *J. Biol. Chem.* 44, 553-61(1920).—Following the methods of Ascoli and Izar (C. A. 1, 868; 2, 425) as closely as possible the effect of several hydrosols upon the autolysis of the liver has been tried. Where accelerations were demonstrated acidity could also be detected, and in preps. highly purified by long dialysis no accelerating action could be found. It is possible that such prolonged dialysis altered the physical character of the colloid and thus rendered it inert, although there was no visible evidence of this. The more likely explanation appears to be the removal of traces of acids or of electrolytes producing acid by hydrolysis. The colloids used were Ag sols, colloidal  $Fe(OH)_3$ , and  $As_2S_3$ , all of them reported as very effective by Ascoli and Izar. It has thus far been impossible to confirm any of the findings reported by these authors."

A. P. LOTHROP

The amphoteric properties of some amino acids and peptides. HANSEN, ROSEWELLER, HELEN MILLER NOYES AND K. GEORGE FALK. Hargraves Research Lab., Roosevelt Hospital, New York City. *J. Gen. Physiol.* 3, 291-308(1921).—The following compds. were used: glycine, alanine,  $\alpha$ -aminobutyric acid, leucine, glycylglycine, alanylglycine and alanylalanine. Data were obtained also for solns. of NaCl, acetone, acetamide, urea, acetic acid and aceturic acid. Solns. containing 0.05 mol. of the compd. under investigation and 0.05 mol. NaCl per l. with varying amts. of 0.1 N HCl or NaOH were studied. H-ion concn. was detd. electrometrically or colorimetrically. The isoelec. points were detd. by a method developed by Sørensen (*C. A.* 5, 3835), and by the potentiometer method. On comparing the H-ion concn. of 0.1 N HCl and 0.1 N NaOH, it was found that the elec. measurement was more sensitive for the latter and the conclusion was reached that alk. solns. may "require the presence of buffer mixts. in order to obtain const. and reproducible results under conditions with which analogous acid solns. apparently give accurate values with no buffer present." The detn. of the isoelec. point of the amino acids by the potentiometer method was not very accurate because the buffer action was so slight and a broad zone existed on the titration curve where traces of alkali or acid could appreciably change the results. This zone was narrower for the dipeptides and consequently more accurate results were obtained with them. The indicator method for the detn. of the isoelec. point gave somewhat more accurate results, but too much stress could not be placed on their exactness. An examn. of the titration curves obtained with  $pH$  values as abscissas and the number of cc. of 0.1 N acid or alkali used as ordinates, led to the following conclusions: Water, urea, acetamide and acetone gave practically identical results. Therefore, at the diln. used no combination involving the amino groups of urea and acetamide and HCl or enolization of urea, acetamide or acetone accompanied by reaction with alk. occurred. The 4 amino acids gave practically identical curves; a broad zone existed near the point at which no acid or alkali was added where there was almost no buffer action. The results with the dipeptides were strikingly similar. Compared with the amino acids, however, they gave a very much smaller range where practically no buffer action was observed. Much more acid or alkali was required to bring the dipeptides to a given  $pH$  than for the amino acids, evidently owing to the  $-CO-NH$  group of the dipeptides, acid combining with it and alkali bringing about enol-lactam rearrangement and accompanying reaction. Aceturic acid, on the acid side, gave the same results as acetic acid and water; on the alk. side, however, the  $pH$  values for aceturic acid were smaller for the same amt. of alkali than those for acetic acid, owing again to the enol-lactam tautomerism of the  $-CO-NH$  group. The authors assume a difference between the positive and negative ions of an amphoteric electrolyte, for example gelatin. This difference is possibly due to tautomeric changes or to the action of the solvent involving hydration. The most satisfactory definition of the isoelec. point is "that H-ion concn. at which the properties such as elec. conductivity, viscosity, soly., etc., when studied over extended ranges of acidity in moderately dil. solns., show a point of inflexion." The authors have deduced the formula of Michaelis and Mostynski (*Biochem. Z.* 24, 79(1910)) for the detn. of the isoelec. point,  $I = \sqrt{(Ka/Kb) \cdot Kw}$ , bringing out the assumptions, they believe, in a more satisfactory manner. The deductions include cases where the mols. ionizing as acid and basic salts are the same, and where they are different mol. species. For details the original article must be consulted.

CHAS. H. RICHARDSON

Ion series and the physical properties of proteins. III. The action of salts in low concentration. JACQUES LOEB. Rockefeller Inst. *J. Gen. Physiol.* 3, 391-414 (1921).—The results of this investigation may be summarized as follows: Ions with the opposite sign of charge than that of the protein ion diminish swelling, osmotic pressure and viscosity of the protein (gelatin). Ions with the same sign, however, appear to have

no effect on these properties when the concn. of the electrolyte is not too high (except in the case of  $H^+$  and  $OH^-$ ). "The relative depressing effect of different ions on the physical properties of proteins is a function only of the valency and the sign of charge of the ion, ions with the same sign of charge and the same valency having practically the same depressing effect on gelatin sols. of the same  $pH$  while the depressing effect increases rapidly with an increase in the valency of the ion." At a concn. in excess of  $M/16$ , "it is not safe to draw conclusions concerning the specific effects of ions on the swelling, osmotic p. or viscosity of gelatin," because "at that concn. the values of these properties are near the minimum characteristic of the isoelec. point." A criticism of the Hofmeister series of ions is given. Cf. *C. A.* 14, 3682; 15, 540. C. H. R.

**Relation between the chemical constitution and taste of perfumes (especially aldehydes, ketones, and their derivatives. A new perfume with sweet taste.** SKIJI FURUKAWA. *J. Tokyo Chem. Soc.* 41, 706-28(1920).—The taste of ketones, aldehydes and their derivs. used in perfumery are investigated with view to discover the relationship between chem. constitution and taste. Since olfactory sense always interferes with gustatory sense, all the expts. on taste were conducted with the nose shut. The results are: (1) Aldehyde and ketones. Anisaldehyde, cinnamaldehyde, heliotropin, salicylaldehyde, *p*-hydroxybenzaldehyde, peryllaldehyde, and fural have a sweet taste. Benzaldehyde (?), vanillin, citral, citronellal, acetaldehyde, formaldehyde, gingerone, menthone, camphor, ionone, methylheptenone, and acetone have not. There is no relationship between arrangement of chain, open or closed, and taste-producing property, although in perfumery the sweet tasting aldehyde has invariably a cyclic chain, and no ketone has yet been discovered which has a sweet taste. (2) Semicarbazones have less sweet taste than the aldehydes and ketones. (3) Phenylhydrazones do not have a sweet taste. (4) Oximes. Presence of  $-CH$  in a 6-C cyclic ring eliminates the taste.



There is no definite correlation between  $\alpha$ -oximes and taste. Hydrochlorides of oximes are indifferent. Nitriles of the oximes have a tendency usually to produce a sweeter taste than oximes, but not always. Acetonitriles, amino-oxime, azoxime, and introduction of acid and amide groups, do not affect the sweet taste. (5) Isomers. In perfumes having open chains, the sweet taste is common to all isomers, but not in cyclic compds. Non-perfumery substances like amino acids, on the other hand, have entirely different taste from their optical isomers. Neither chem. reactivity nor chem. action between taste organs and these compds. is responsible for the sweet taste. A mol. as a whole must play the important part, probably through such medium as mol. vibration, resonance, or elec. vibration. Various reasons are given to show that the factors responsible for taste and odor are not necessarily the same. *Peryllartine*,  $\alpha$ -anti-peryllalaldoxime (Japanese P. 35,332), is a new perfume with a sweet taste. It is not so irritating as anisalaldoxime and benzalaldoxime, gives a cooling sensation, m.  $102^\circ$ , difficultly sol. in  $H_2O$ , but sol. in alc. and ether, and is not toxic to higher animals. It is the sweetest compd. on record, being 2000 times sweeter than cane sugar and several times sweeter than saccharin. When given to the higher animals, it is eliminated as gluconic acid. Taste of peryllaldehyde and its derivs. are given, their relative sweetness being shown. **Supplementary note.** *Ibid* 41, 979-80.—Kodama reports that acetophenone oxime tastes sweet. F.'s original statement that no oximes of ketones in perfumery are known to have a sweet taste is corrected. S. T.

**Teudt's resonance theory of odor.** SHINTARO KODAMA. *J. Tokyo Chem. Soc.* 41, 975-7(1920).—K. gives a review of Teudt's theory (*C. A.* 14, 2444) and points out from it certain similarity to his own theory of taste and odor (cf. *C. A.* 14, 1317, 2305). Since K.'s theory was first presented at the March Meeting Tokyo Chem. Soc., and T.'s abstract did not reach Japan till July 1920, K. maintains that both T.'s and his theories are independent contributions. S. T.

The law of probability applied to the formation of fats from carbohydrates. E. J. WITZEMANN. *J. Phys. Chem.* 25, 55-60(1921).—There are two general types of hypotheses concerning the chemical mechanism of the formation of fatty acids from carbohydrates: (1) they are built up mainly from short C chains (less than 6); (2) they are built up mainly from chains of 6 C atoms. In organisms most of the fat is formed from the abundant sugars having 6 C atoms. Since natural fats are mainly composed of  $C_{18}$  acids the relations in (2) are statistically true. If (1) is correct the preponderance of  $C_{18}$  acids could only be explained by a sharp break at  $C_{18}$  in a physical property significant for synthesis. Such a break is not known. Consequently the synthesis apparently becomes amenable to the law of probability. A probability diagram constructed on the basis of a rough estimate of the relative occurrence of fatty acids gives the typical form of the probability curve only when the points  $C_6$ ,  $C_{12}$ ,  $C_{24}$  and  $C_{30}$  are connected. When the physical properties of this series are considered there is a sufficient change in passing from  $C_{12}$  to  $C_{18}$  to account for the preponderance of  $C_{18}$  acids. The results constitute an argument for Emil Fischer's hypothesis (1, 2) and constitute a different application to biology of this fundamental law from that known as Quetelet's law of fluctuating variation. E. J. WITZEMANN

Electrical expression of human emotion (WALLER) 4.

SCHLEICH, CARL LUDWIG VON: Das Problem des Todes. Berlin: Ernst Rowohlt Verlag. 49 pp. M. 6. 50. For review see *Kolloid.-Z.* 28, 48(1921).

#### B—METHODS AND APPARATUS

STANLEY R. BENEDICT

The determination of glucose in blood and in the cephalorachidian fluid. AL. IONESCU AND V. VARGOLICI. *Bul. soc. chim. România* 2, 102-6(1921); cf. *C. A.* 14, 3812.—The method gives accurate results in the analysis of solns. contg. very small quantities of glucose. It depends upon the fact that glucose in alk. soln. reduces  $K_3Fe(CN)_6$  to  $K_4Fe(CN)_6$  and this is titrated with approx. 0.03 *N*  $KMnO_4$ . The blood or cephalorachidian fluid is first clarified by treatment with 20% trichloroacetic acid soln. In a 250 cc. flask, place 3 to 4 cc. of  $K_3Fe(CN)_6$  soln., 5 cc. of  $H_2O$  and from 1 to 10 cc. of the clarified glucose soln. Boil 1 min., add 100 cc.  $H_2O$  and 4 or 5 cc. of 20%  $H_2SO_4$ . Titrate with  $KMnO_4$  until the green color is replaced by the permanganate pink. W. T. H.

Test for formaldehyde in urine. E. PITTARELLI. *Riforma medica* 36, 936(1920); *J. Am. Med. Assoc.* 76, 211.—To 25 cc. urine add 10 drops of a 1% phenylhydrazine soln. and heat to 100°. Set aside for a few min. and add 5 drops of a 1% soln. of the developer, metol (methyl-*p*-aminophenol), and 3 drops of 25%  $NaOH$ . In the presence of formaldehyde or hexamethylenetetramine the fluid turns scarlet. On the addition of satd. soln. of  $MgSO_4$  the fluid turns blue. L. W. RIGGS

Blood-gas analysis. F. VERZÁR AND MARIA GARA. *Arch. ges. Physiol.* 183, 235-8(1920).—The authors have so modified Barcroft's method of blood-gas analysis that immediate detns. are not necessary to avoid error. Blood collected with calibrated pipets is mixed under paraffin oil with a soln. of the following compn.: pure liquid ammonia 2 cc., Na citrate 5 g., saponin 0.5 g., distd. water to 100 cc. Samples of blood so collected may stand for at least 1 hour without undergoing change. G. H. SMITH

#### C—BACTERIOLOGY

A. K. BALLS

A method of investigating the action of ultra-violet rays on bacteria. TOSHIKAZU MASHIMO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 1-11(1919).—The culture medium was prepared by placing a glass plate of suitable size in horizontal position. On this was placed a metal frame of slightly smaller size. Melted agar was poured on for a thickness of about

3 mm. The suspension of bacteria in physiol. NaCl solution was then smeared on the surface. The plate was put in a plate-holder, exposures made, and then incubated 12 to 24 hrs. The transparent image of the spectral lines, shown on a white background, was fixed in HCHO vapor. Data for 7 strains of bacteria are given, and show that the bactericidal effect begins suddenly at 2950 Å, reaches a max. at 2750 Å, and then decreases slowly. The lower limit of bactericidal action in the extreme ultraviolet is about 1800 Å. Ultraviolet rays appear to have no detrimental effect on enzyme action.

A. L. BARKER

The formation of acetaldehyde in the decomposition of sugar by fungi. CLARA COHEN. *Biochem. Z.* 112, 139-43(1920).—Studies of the action on grape sugar of the fungi, *Aspergillus cellulosae*, *Monilia candida*, *Mucor racemosus*, *Mucor rouxii* and *Oidium lactis* showed that AcOH is produced in all cases.

F. S. HAMMETT

Acetaldehyde as an intermediary product in the fermentation of sugar by *Bacillus lactis aerogenes*. C. NEUBERG, F. F. NORD AND E. WOLFF. *Biochem. Z.* 112, 144-50(1920).—It was found that AcH is an intermediary product of the action of *B. lactis aerogenes* on grape-sugar. The finding is taken as demonstrating that in many types of sugar fermentation AcH takes a central position and plays an important role in the economy of the various organisms.

F. S. HAMMETT

The bacterial flora of several medical substances. L. M. LANSBERG. Rotterdam. *Centr. Bakt. Parasitenk., Abt. II* 51, 280-6(1920); cf. *C. A.* 14, 592.—Gives the bacterial content and bactericidal power of a no. of medicinal substances commonly used.

JULIAN H. LEWIS

Disinfection with vapors. C. S. STOKVIS. Amsterdam. *Centr. Bakt. Parasitenk., Abt. I* 85, 165-76(1920).—It has been claimed that the vapors of disinfectants at lowered temp. (produced in a vacuum) are more bactericidal than at the true boiling point. The authors find that this is true only for CHOH. The vapors of a 1% soln. of CHOH at 50° and 85 mm. pressure is bactericidal for staphylococcus in 3 mins.

JULIAN H. LEWIS

A new bacterial culture medium. R. STANDFUSS AND E. KALLEKT. *Centr. Bakt. Parasitenk., Abt. I* 85, 223-4(1920).—A cheap culture medium made by cooking the bones of slaughter-house animals in the autoclave with a pressure of 2-4 atms.

JULIAN H. LEWIS

Relation of different strains of influenza bacilli as shown by cross agglutination and absorption tests. HOWARD H. BELL. St. Louis, Mo. *J. Infect. Dis.* 27, 464-75(1920).—The influenza bacillus represents a heterogeneous group of organisms as shown by agglutination and absorption tests. Identical strains occur. No differentiation can be made by these methods between the organisms isolated from normal healthy throats within 2 mos. preceding the epidemic and those isolated from the throats of influenza patients. A person may carry 3 different strains of this organism at the same time. The morphology alone is unreliable as a means of dividing this group of organisms into subgroups.

JULIAN H. LEWIS

The fermentation of xylose by bacteria of the aerogenes, paratyphoid B and typhoid groups. E. B. FRED AND W. H. PETERSON. Univ. Wis. *J. Infect. Dis.* 27, 539-49(1920).—Xylose in yeast water peptone solus. is readily fermented by bacteria of the aerogenes and paratyphoid B groups. These organisms break up xylose with a rapid evolution of gas. The products of fermentation with *B. lactis aerogenes* are essentially CO<sub>2</sub>, H<sub>2</sub> and alc.; in this respect the aerogenes forms are somewhat similar to the yeasts. In addition to these products, small amts. of volatile acids are found. The 2 substances, CO<sub>2</sub> and EtOH, represent about 75% of the sugar consumed. In relation to reaction, the aerogenes organisms produce acid, at first, until the medium is about pH 4.4; later this reaction reverts to an approx. pH 5.0. The destruction of sugar takes place rapidly. The main products formed in the fermentation of xylose by paratyphoid



B are formic, acetic, butyric, lactic, and succinic acids,  $\text{EtOH}$ ,  $\text{CO}_2$ , and  $\text{H}_2$ ; these products represent about 92% of the original sugar. Xylose is fermented rapidly and almost completely by the paratyphoid B organisms. In agreement with the aerogenes bacteria, these organisms form large amts. of alc. and  $\text{CO}_2$ . The fermentation of xylose by the typhoid bacteria is far from complete. In general not more than  $\frac{1}{4}$  of the xylose is decompd. No gaseous products except small amts. of  $\text{CO}_2$  were found. The chief substances are alc., formic, acetic, butyric, and succinic acids, and a trace of  $\text{CO}_2$ . The greater part of the fermented xylose is represented by the succinic acid. It is clearly shown from the results of this work that xylose is attacked by the organisms of the aerogenes-typhoid group with the production of volatile, non-volatile, and gaseous substances. Although the organisms included in this study are placed in the same group, their by-products differ quantitatively and qualitatively.

JULIAN H. LEWIS

The testing of germicidal substances against the gonococcus. DAVID M. DAVIS AND EARNEST O. SWARTZ. Johns Hopkins Univ. *J. Infect. Dis.* 27, 591-601 (1920).—The application of the principles of germicidal action to tests using the gonococcus as the test organism is discussed. A new, practical and reliable method for making germicidal test with the gonococcus as the test organism is presented. J. H. L.

Chemical composition of the tubercle bacillus. I. A. GORIS. II and III. A. GORIS AND A. LIOT. *Ann. inst. Pasteur* 34, 497-546 (1920); cf. *C. A.* 14, 3262.—G. has studied 3 phases of the chemistry of the tubercle bacillus and gives an extensive review of the work already done on each. I. Org. constituents; lipoids chiefly are considered. Previous investigations have shown that by the use of suitable lipid solvents, as  $\text{CHCl}_3$ ,  $\text{EtOH}$ ,  $\text{Et}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ , and  $\text{C}_6\text{H}_5(\text{CH}_3)_2$ , about 40% of the dry wt. of the organism can be extd. The ext. contains a wax which consists partly of an ester of an alc. of high mol. wt., the fatty acids, oleic, lauric, palmitic, stearic, and arachidic, a phosphatide, probably lecithin, and possibly a substance of the group of cholesterol. G. used large quantities of a mixt. of human and bovine bacilli grown on glycerol broth, killed at  $110^\circ$ , filtered, washed, thoroughly dried and triturated. Approx. 40% of the dried material dissolved in  $\text{CHCl}_3$ . The crude lipid melted at  $42^\circ$ . Its sapon. no. was 124.4, acid no. 37.0, and esterification no. 87.4. The Hehner no. (sum of insol. fatty acids and non-saponifiable lipoids) was 69.77 and the I no. 16.22. Four partitions were made of the  $\text{CHCl}_3$  soln. First, a substance which proved to be insol. in  $\text{Et}_2\text{O}$  sepd. out on concn. of the  $\text{CHCl}_3$ . This substance G. calls *hyalinol*, referring to its physical appearance. The mother liquor was evapd. to dryness and the residue taken up in boiling acetone. A residue was left and on chilling the acetone more deposited. Finally the cold acetone soln. was evapd. to dryness. The *hyalinol* made up 1% of the dry wt. of the bacilli, 2.5% of the lipid. It melted at  $175^\circ$ , softening between  $160$  and  $165^\circ$ . It was hard and elastic, and quite insol. in  $\text{H}_2\text{O}$ ,  $\text{EtOH}$ ,  $\text{Me}_2\text{CO}$ , and  $\text{Et}_2\text{O}$ . On purification by repeated soln. in  $\text{CHCl}_3$  and pptn. with  $\text{Et}_2\text{O}$ , it analyzed as follows: C 55.5%, H 7.15%, O by difference 37.35%. On saponification it yielded an unknown substance and a mixt. of crotonic and isocrotonic acids. The waxy material insol. in acetone contained N and P and stearic and palmitic acids, apparently in substances of the phosphatide group, and lauric acid in combination with an alc. of high mol. wt., m.  $64^\circ$ , corresponding to descriptions of "mykol." A S-containing substance and an alc. melting at  $100^\circ$  were also present. In the acetone-sol. fraction glycerides of butyric, caproic, oleic, palmitic, stearic, and arachidic acids were identified. Cholesterol could not be identified surely in the liquid of the tubercle bacillus, although a substance was encountered which in  $\text{CHCl}_3$  soln. gave a weak coloration like that of cholesterol with  $\text{H}_2\text{SO}_4$  on prolonged standing. After the  $\text{CHCl}_3$  extn. the lipid-free, redried bacilli were taken up in water and the water-sol., alc.-insol. substances pptd. with 2-5 vols. of  $\text{EtOH}$ . The ppt. was a nucleo

protein containing N and P and a hexose. It was toxic for tuberculous guinea pigs. The water and alc.-sol. fraction contained protein split products, among which tyrosine and leucine were easily identified. Neither monoses nor polyoses were present. A search for enzymes in the tubercle bacillus was made and no sugar-splitting enzyme was encountered. II. The mineral compn. of the tubercle bacillus was next detd. The ash made up 2.5% of the dry wt., of which 43.4% was  $P_2O_5$ , 22.8%  $SO_4$ , 11.6% Na, 9.7% Ca, 7.7% K, and 5.7% Mg. Traces of Fe and Mn were found. The crude lipid gave 1.17% ash, largely phosphate, the figure for the latter indicating that about 5% of the lipid was lecithin. III. Finally the problem of acid-resistance was studied. Much confusion exists on this subject, acid-fastness having been attributed by various authors to a difficultly permeable membrane, or to substances within the body with a strong affinity for the fuchsin stain, protein in nature according to some, chitinous according to others, and lipoidal according to others, the best evidence probably being for the last. G. and L. found that completely defatted bacilli were not acid-fast. Of the lipid substances hyalinal was found to be non-acid-fast, while the solid fatty acids were moderately acid-fast, and the mykol strongly so. Tests of acid-fastness were made by impregnating paper strips with a  $CHCl_3$  soln. of the lipid in question, drying, soaking in hot carbol fuchsin soln. 5 min., and then destaining in 25%  $H_2SO_4$ , alc. and finally water.

E. R. LONG

**Properties of lactic microbes; their classification.** PAUL VAN STEENBERGE. *Ann. inst. Pasteur* 34, 803-70(1920).—Lactic acid-producing organisms may be classified as cocci and bacilli, and from the point of view of culture as flocculating and non-flocculating. Most of them require 20-30 days at 30° to produce max. acidity, the degree of which in a medium sufficiently rich in nutritive N is proportional to the concn. of the sugar present. The organisms are classified on the basis of the acidity produced as true lactic microbes, not producing  $CO_2$ , giving rise to lactic acid exclusively, and  $CO_2$  producers, which give rise to succinic, acetic and formic acids besides lactic acid, and also alcohol and glycerol. For a given species the production of lactic acid is about the same from different sugars, and the other acids are qualitatively the same. Some organisms, however, notably the non-flocculating, show little activity toward lactose. The  $CO_2$  formers produce from levulose much mannitol and volatile acid. All species reduce Na selenite and tellurate. Those species not producing volatile acid do not reduce methylene blue or levulose. The  $CO_2$  producers reduce them, a relation existing between the  $CO_2$  and volatile acid production and the reducing power. The reduction is attributed to an endo-enzyme, for which the name *levulo-mannitase*, is proposed. The flocculating organisms not producing  $CO_2$  attack and acidify mannitol. No species attacks Ca lactate. Slight development may take place at the expense of Ca malate. Amygdalin is not decomposed. All species are inhibitive to yeast because of the acid formed, especially the volatile acid, lactic not being very harmful, and because of an agglutinating viscous substance formed. Maltose apparently undergoes acidification without previous hydrolysis. Acid is formed from saccharose, also without previous inversion. The organisms do not form acid at the expense of the nitrogenous constituents of the medium. A reaction close to neutrality is most favorable to growth; an acidity of 5-7 cc. N acid per 100 cc. inhibits. NaCl favors in concns. between 0.02 and 0.05%. Cultures live 5 mos. to 1 (one) yr., vitality being maintained longest on must media containing chalk.

E. R. LONG

**A note on the effect of amino acids on the growth of tubercle bacilli.** PETER MASUCCI. *J. Lab. Clin. Med.* 6, 96-8(1920).—Tubercle bacilli were grown in 2 sets of broth: Both had a glycerol-meat infusion basis, but No. 1 contained 2% Difco peptone and No. 2 1.7% Difco peptone plus 0.3% Aminoacids. No. 1 analyzed as follows: solids 9.22, ash 1.05,  $P_2O_5$  0.116, N 0.348, N pptd. by  $ZnSO_4$  0.110, N as amino acids 0.098%. The corresponding figures for No. 2 were 9.19, 1.00, 1.76, 0.369, 0.098.

and 0.138%, showing a marked increase in  $P_2O_5$  and amino acid N. Growth of the tubercle bacillus was much better on No. 2. Varying concns. of Ammonia were tried and 0.3-0.5% was found most satisfactory. Increased growth is probably due to the increased P as well as amino acid N, P being an important constituent of the tubercle bacillus in lecithin and nucleic acid mols. The osmotic pressures of plain and glycerol broth (5% glycerol) were compared and found to be 7.2-10.8 and 31 atms. resp. the glycerol thus increasing osmotic pressure 3-fold.

E. R. LONG

Certain factors that influence acetone production by *Bacillus acetoethylicum*. C. F. ARZBERGER, W. H. PETERSON AND E. B. FRED. Univ. Wis. *J. Biol. Chem.* 44, 465-79 (1920).—"A study has been made of the products formed, the factors influencing the end-products, and the relation of these products to one another in the production of acetone by *Bacillus acetoethylicum*. It ferments glucose, sucrose, potato starch, and xylose in a peptone-phosphate (0.5% peptone, 0.1%  $K_2HPO_4$ ) medium with the production of  $AcOH$ ,  $HCO_2H$ , and lactic acid,  $EtOH$ , acetone, and  $CO_2$ . These products represent 90-95% of the sugar fermented. In a 2% soln, 75-80% of the original carbohydrate is fermented within 10-15 days. The optimum condition for acetone production is at a  $pH$  of 5.8-6.0. The influence of the reaction of the medium has a very marked effect upon the products formed. An alk. medium maintained at about  $pH$  8.0 is fermented with the formation of large amts. of volatile acids and comparatively small amts. of  $EtOH$  and acetone. A balance must exist therefore between these 3 products in the fermentation of the above carbohydrates. An increase in the volatile acid content signifies a corresponding decrease in the amt. of  $EtOH$  and acetone present. *Vice versa*, an increase of acetone and  $EtOH$ , where the fermentation takes place under optimum conditions for the production of these products, is accompanied by a decrease in the yield of volatile acids. Acetone is not produced immediately in new cultures, but is formed after several days of fermentation. The volatile acid formed is composed of about 45%  $HCO_2H$  and about 55%  $AcOH$ .  $EtOH$ , with traces of some higher alcs., is produced in amts. varying from 8 to 25%, depending upon the reaction of the fermenting medium. Small amts. of non-volatile acid are produced; this acid has been shown to be lactic. Potato starch medium when inoculated with *B. acetoethylicum* is first liquefied and then goes through a process of hydrolysis. No reducing sugars have been detected in a fermenting culture of this kind. Cultures previously treated with  $C_2H_5$ , or freed from organisms by filtration, also produced similar changes in a starch medium. Traces of reducing sugars were found, and a characteristic red color was always produced when treated with I soln. The hydrolysis of starch into dextrin-like substances indicates the liberation of enzymes by the bacterial cell which function as hydrolytic agents. The negative tests for reducing sugar do not exclude the probability of their formation during bacterial activity, for the sugars may be utilized by the organism as rapidly as they are formed."

A. P. LOTHROP

The cultivation of yeast in solutions of purified nutrients. MARGARET B. MACDONALD AND E. V. MCCOLLUM. Johns Hopkins Univ. *J. Biol. Chem.* 45, 307-11 (1921).—"The multiplication of yeast in 15 successive seedings has been secured in nutrient solns. of purified chem. substances having the following compn.: 1 l. distd.  $H_2O$ , 20 g. sucrose, 3 g.  $(NH_4)_2SO_4$ , 2 g.  $KH_2PO_4$ , 0.25 g.  $CaCl_2$ , 0.25 g.  $MgSO_4$ . The sucrose was prepd. from the best granulated cane sugar by repeated pptn. from a concd. aq. soln. by abs. alc. and the salts were all c. p. "The results of the efforts to cultivate yeast in nutrient solns. containing no possible source of the antineuritic factor have been of such a nature as to make us seriously question whether yeast is dependent on a supply of the antineuritic principle for its continued multiplication. Successive seedings with very few cells have been carried sufficiently far to reduce the possible content of the antineuritic substance ('bios' of Wildiers (*La Cellule* 18, 313),  $H_2O$ -sol-

B) to vanishingly small amts. Sufficient quantities of yeast have been grown in this purified nutrient soln. to furnish 2-5 g. of dry substance. It would seem that but one of two conclusions is admissible; i. e., either yeast must grow without 'blobs' or it must synthesize the substance to meet its own needs. Feeding expts. with yeast grown under the conditions described are contemplated and should yield results of unusual interest." Amino acids and other extractives added to such purified nutrient solns. have a remarkable stimulating effect on the growth of yeast. When yeast is used as a test organism to det. the content of antineuritic substance in exts. of natural foods by the extent of the proliferation of yeast cells, there are always added, with the antineuritic substance, many others having a favorable influence on the growth of yeast cells. It seems unlikely, therefore, that the test as carried out by Williams (C. A. 13, 2390) and Bachmann (C. A. 14, 755) has any element of specificity.

A. P. LOYTHROP

Further observations on the eosin-methylene blue agar. MAX LEVINE. Iowa Section, Ani. Water Works Assoc. 1920; *Eng. Congr.* 55, 47(1921).—The method suggested is to differentiate *B. coli* and *B. aerogenes*. The medium consists of 1.0% peptone, 0.2%  $K_2HPO_4$ , 1.5% agar, 1.0% lactose, and eosin and methylene blue as indicators. The method of prepn. of media and the criteria for observation are detailed.

LANGDON PEARSE

#### D—BOTANY

CARL L. ALSBERG

The development of the protein and fat content in oil-seed and fiber plants. KLEBERGER. Giessen. Referee at the meeting of German naturalists and physicians at Bad-Nauheim. *Chem. Umschau* 28, 2-5(1921).—The seeds of 5 cultivated plants were analyzed for 4 yrs. during 3 stages of development: (1) Milk-ripening, during which the green seed is fully developed but is without any visible sign of ripening; (2) yellow ripening, during which the seed shows distinct signs of ripening, usually turning light yellow or light brown; (3) full ripeness, when the seed shows its normal ripe color, the life of the plant being fully completed. The following seeds were investigated: (1) Rapeseed, (2) poppyseed, (3) linseed, (4) hempseed, (5) "Leindotter" (*Camelina sativa*). The results are shown in 2 tables which may be summarized as follows: (1) During milk ripening the N materials are highest, much in the form of amides, but the true proteins amount to only 15-20% of total N matter. The fat content is very low, mainly in the form of resinous and wax-like aggregations in the outer seed-cover. (2) During the yellow ripening the total N materials and amides decrease considerably, the true proteins increasing only slightly; but the fat content increases greatly, and the poppyseed, linseed and "Leindotter" contain 50% or more of the final amt. in the ripe stage. Hempseed makes an exception, showing as much as 45% of protein content when ripe and nearly all of its final fat content. (3) At full ripeness the total N materials and amides are further diminished while the true proteins amount to 50-60% of the total N matter. Likewise the fat has increased to its limit, viz., 30-45% of total seed on the dry basis; the resinous and wax-like substances form only an insignificant portion. \*

P. BACHER

Rhinanthocyanin. A. NESTLER. *Ber. bot. Ges.* 38, 117-21(1920); cf. C. A. 14, 1860.—When rhinanthin is extd. from the seeds of *Alectorolophus hirsutus* by means of 70% alc. containing 5% of HCl, the glucoside is gradually hydrolyzed by the acid into a blue coloring matter, rhinanthocyanin, and a sugar. This hydrolysis may be effected also, although less rapidly, by sulfuric, oxalic, citric, lactic, or acetic acid, and the production of the so-called blue (mostly dark brownish violet) bread is due to contamination of the flour with the meal of seeds containing rhinanthin and hydrolysis of the latter by means of the lactic acid formed during the fermentation. In the course of a few hours or days, the blue rhinanthocyanin soln. becomes colorless and deposits

blue or green granules, which sometimes retain their color for many weeks, and sometimes turn brown. Rhinanthocyanin imparts a blue or green coloration to the granules but does not dissolve therein; the color is due to the presence of granules 0.5-1  $\mu$  in size, and of droplets of 2.5-7  $\mu$ , and is removable by ultra-filtration.

Some proteins from the mung bean, *Phaseolus aureus* Roxburgh. CANTON, JOHNES AND HENRY C. WATERMAN. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 74, 303-17(1920).—The mung bean, which is an important crop in southern Asia, the Malay Islands, eastern Africa and India, has also been cultivated with some success in the middle and southern U. S. The plant has been grown both as a forage crop and green manure for wheat. The bean contains about 21.74% of protein, of which 87.5% is extd. by 5% NaCl soln. The NaCl ext. contains two globulins, an  $\alpha$ -globulin pptd. at 0.15-0.20 of satn. with  $(\text{NH}_4)_2\text{SO}_4$  and a  $\beta$ -globulin pptd. at 0.65 satn. The  $\alpha$ -globulin coagulates from its slightly acidified soln. at 95-100°, contains 1.5% of S and the following %'s of basic amino acids: cystine 1.49, arginine 5.13, histidine 3.31, lysine 6.08. The  $\beta$ -globulin coagulates at 68-71° and contains 0.4% of S, 7.58% of arginine, 2.02% of histidine and 9.29% of lysine. So little cystine is present that the remaining undecompd. after hydrolysis escapes pptn. by phosphotungstic acid and cannot be detd. With the exception of the extremely small proportion of cystine, the N distribution of the  $\beta$ -globulin is similar to that of other bean globulins. In the  $\alpha$ -globulin the % of arginine is decidedly low and the lysine N is not so high as in most of the bean globulins analyzed. Traces of albumin (0.02-0.05%) coagulating at 45° are also present.

A. P. LOTHROP

Dihydroxyphenylalanine, a constituent of the velvet bean. EMERSON R. MILLER. Ala. Agr. Expt. Sta. *J. Biol. Chem.* 44, 481-6(1920).—The velvet bean, *Stizolobium deeringianum* Bort, has been found to contain 3,4-dihydroxyphenylalanine, a substance sep'd. from the seedlings and pods of *Vicia faba* by Torquati (C. A. 7, 2449, 2774) and by Guggenheim (C. A. 8, 1128). The compd. has been actually sep'd. only from the Georgia velvet bean, but the characteristic reactions of this amino acid have also been obtained with aq. exts. of 26 varieties of velvet beans and with exts. of the *Vokobana* (*Stizolobium hassjoo* Piper and Tracy) and Lyon (*Stizolobium niveum* Kuntz) beans; and it is highly probable that it is a characteristic constituent of the seeds of the plants of the genus *Stizolobium*. It has not been found in seeds from several species of the other genera of the family Leguminosae. Its pharmacological action is quite pronounced; several persons who ate small amts. of cooked Lyon beans experienced both vomiting and purging. The substance is rather closely related chem. to adrenaline and it is probable that long-continued feeding of velvet beans may cause harmful results.

A. P. LOTHROP

The relative amounts of the three bases, potash, lime and magnesia, in cultivated plants. H. LAGATY. *Compt. rend.* 172, 129-31(1921).—The values for the percent of each of these bases in the total of the three in various plants are plotted on triangular coordinates. The relations among the bases, brought out very clearly in this way, may serve as an aid in interpreting the differing effects of the same soil treatment on different plants.

T. G. PHILLIPS

The calcifuge plants of the inland dunes of the island of Goeree. TH. DE VRIES. *Proc. Acad. Sci. Amsterdam* 23, 475-80(1921).—The soil of the inland dunes contains about 0.015% Ca, that of the dunes nearer the sea about 0.90% Ca. The flora of the inland dunes consists of calcifuge plants, e. g., *Sarcothamnus vulgaris*. W. considers the controlling factors to be (1) the effect of the balance of mono- and divalent ions, especially  $\text{K}^+$  and  $\text{Ca}^{++}$ , on the roots of the plants, and possibly (2) the reaction of the soil soln.

exte. T. G. PHILLIPS

Nitrogen fixation by cowpeas and nodule bacteria. L. L. WHITING AND WARREN R. SCHOONOVER. *Soil Sci.* 10, 411-20(1920).—Analyses were made of

inoculated and uninoculated cowpeas planted in N-free sand and furnished with N-free mineral salts and  $H_2O$ . A comparison of the N content of the inoculated plants with that of the seeds of uninoculated plants shows that a marked fixation of N occurs shortly after the formation of the first true leaf. This in 3 expts. was 19 days after planting. The first appearance of N fixation was 9 days after planting. By 26 days after planting the N fixed was 3 times that contained in the original seed. Tests with diphenylamine and brucine, with  $\alpha$ -naphthylaminesulfonic acid and with Nessler's soln. failed to show  $NO_3$ ,  $NO_2$  or  $NH_3$  in the inoculated seedlings. Inorg. N of these forms is not concerned in symbiotic fixation by legume and nodule bacteria.

W. J. ROBBINS

The hydrogen-ion concentration of certain three-salt nutrient solutions for plants. A. G. MCCALL AND J. R. HOAG. *Soil Sci.* 10, 481-5(1920).—Using Gillespie's method of H-ion detn. it was found that in general with any one type of 3-salt nutrient soln. the H-ion concn. is a function of the proportion of  $KH_2PO_4$  present. Types of solns. containing  $KH_2PO_4$  have a lower H-ion concn. than those containing  $Mg(H_2PO_4)_2$  or  $Ca(H_2PO_4)_2$ . The  $SO_4$  and  $NO_3$  play minor parts in detg. the reaction of the solns. The variations in plant growth obtained in these solns. cannot be correlated with differences in H-ion concn.

W. J. ROBBINS

The concentration of sodium nitrate tolerated by tobacco plants. G. D. BUCKNER, A. M. PETER AND E. J. KENNEY. *Soil Sci.* 10, 467-81(1920).—Wilted or unwilted tobacco plants about 10 in. long were placed in tap water containing varying quantities of  $NaNO_3$ . Solns. containing more than 1 part  $NaNO_3$  to 3750 parts of tap water cause wilting. Concns. of 150 parts of  $NaNO_3$  to 3750 parts of tap water cause wilting which is more or less permanent. Solns. containing 2-3 parts of  $NaNO_3$  to 3750 parts of tap water give the best general development.

W. J. ROBBINS

The influence of iron in the forms of ferric phosphate and ferrous sulfate upon the growth of wheat in a nutrient solution. LINUS H. JONES AND JOHN W. SHIVE. *Soil Sci.* 11, 93-9(1921).—The growth of wheat in water cultures containing mineral salts to which  $FePO_4$  or  $FeSO_4$  containing equiv. amts. of Fe were added indicates that  $FeSO_4$  is a more available source of Fe than  $FePO_4$ .

W. J. ROBBINS

The forms of nitrogen in soy bean nodules. W. H. STROWD. *Soil Sci.* 11, 123-30(1921).—An examn. of 100 g. of soy bean nodules failed to show the cyanide radical by a method delicate to 0.01 mg. HCN. 30-40% of the total N in nodules is sol. in  $H_2O$  and 40-55% sol. in 10% salt solns. or dil. alkali. About 3% of the water-sol. N was in the form of protein and proteose. No globulin and only a small amt. of albumin was found. Of the protein-free sol. N 16% of the total water-sol. N was present as primary amino N and 19.3% as amide N. Over 60% of the total  $H_2O$ -sol. N was pptd. by phospho-tungstic acid.

W. J. ROBBINS

#### E—NUTRITION

PHILIP B. HAWK

##### NORMAL

Metabolism of Europeans in the tropics. W. CASPARI. *Die Umschau* 25, 77-9 (1921).—The basal metabolism of several men was found to be the same in Berlin and tropical Africa but the metabolism of the same men at work in Africa was 10% less than in Berlin.

H. V. ATKINSON

The question of calcium deficiency in food. RUBNER. *Vierteljahrs. ger. Med.* 60, 1-26(1920).—A report of the effect of the allied blockade on the food conditions of Germany, with particular reference to the questions of a Ca deficiency in the available foods.

F. S. HAMMETT

Vitamines and the nutrition of food. BIDAULT. *Rev. sci.* 59, 13-5(1921).—A discussion of canned and other preserved foods in relation to vitamins and de-

iciency diseases. Experiences of the Russian and French armies and of the British in the siege of Kut-el Amera are cited. The theory that the  $\text{NH}_3$  produced in foods by high temps. is responsible for the loss of vitamin activity is held to be untenable.

H. B. LEWIS

The distribution of accessory food factors (vitamines) in plants. E. MARION DELF. Univ. London. *S. African J. Sci.* 17, 121-5(1920).—A general consideration of the distribution of the water-sol. (antineuritic), fat-sol. (anti-rachitic) and antiscorbutic vitamins in plants. Recent (still unpublished) expts. have shown that the etiolated inner white leaves of cabbage do not contain growth-promoting vitamins, though the antiscorbutic vitamin is present. Probably the production of fat-soluble vitamin is in some way connected with photosynthesis in the green leaf. Vitamins may also be produced and deposited with reserve materials in various plants. A table showing the distribution and relative amts. of the three vitamins in vegetables and other foods is given.

CHARLES H. RICHARDSON

Antiscorbutic property of some foodstuffs in Japan. T. KOGA. *Bull. Naval Med. Assoc. Tokyo*, Nov. 1920; *J. Am. Med. Assoc.* 75, 1805.—Guinea pigs were fed on bean cellulose mixed with foodstuffs selected for examn. When 15 g. cabbage were given daily with bean cellulose, the animals were healthy up to the 41st day of the expt., while those fed exclusively on bean cellulose were generally attacked on the 15th day by a morbid condition resembling scurvy and died on the 24th day. Pickled radish, pickled plums, bean paste, salt pork and salted salmon could not protect the animals from the disease. Twenty g. of sprouting red beans, given daily, had an antiscorbutic effect like cabbage. Red beans could be stored indefinitely and sprouted any time by moisture and warmth.

L. W. RIGGS

Nitrogenous equilibrium and carbohydrates in the diet. A. DESGREZ AND H. BERRY. *Compt. rend.* 171, 1393-6(1920); cf. *C. A.* 14, 2812.—Rats fed a ration per g. of rat per day of 0.0078 egg albumin, 0.016 fat consisting of 1, 0.5 and 1.5 parts of beef, mutton and pork fat resp. and 0.019 of sugar consisting of lactose 1 and sucrose 9, showed a nitrogen balance of +0.02 on the third day. If a part of the sugar in this ration is replaced by an isodynamic amt. of fat the N balance becomes -0.06. A return to the first ration is followed by a + N balance. Under a certain minimum carbohydrates cannot be supplied by any other food and N equil. maintained.

L. W. R.

Urine as vitamin. F. CURATOLO. *Policlinico* 27, Med. sec., 439(1920); *J. Am. Med. Assoc.* 76, 146.—C. has confirmed Gaglio's assertions in regard to the protecting action of urine against deficiency disease in pigeons. Birds fed 20 g. polished rice in a ration do not develop polyneuritis when 5 cc. rabbit urine is given with the rice. Pigeons which have developed the disease regain their normal health under systematic administration of rabbit urine, which appears to be equally effective against the spastic and the paralytic forms of polyneuritis in pigeons. The vitamins Funk extd. from beer yeast showed a curative action only against the spastic form. C. evapd. rabbit urine to dryness and found that the inorg. mixt. of salts had no action as a vitamin. Its potency must therefore reside in the nitrogenous waste in the urine.

L. W. R.

Influence of food on metabolism. S. CORINALDESI. *Riforma medica* 36, 925 (1920); *J. Am. Med. Assoc.* 76, 210.—C. applied the Bang micro-methods and found it possible to follow the changes in the intermediate and external metabolism from hr. to hr. He thus established a curve of metabolic disintegration and catabolic elimination of the N substances introduced in the food. Minute details of 4 cases are recorded, and the practical conclusion is emphasized that as the urea content of the blood and urine fluctuates within such a wide range in normal conditions during the hrs. of digestion, the clinical record of the intermediate and external metabolism should be taken fasting and at least 7 or 8 hrs. after a meal.

L. W. RIGGS

## F—PHYSIOLOGY

ANDREW HUNTER

**Studies in the physiology of the liver. I. Technic and general effects of removal.** F. C. MANN. Mayo Foundation, Rochester, Minn. *Am. J. Med. Sci.* **161**, 37-42 (1921).—The operation, performed in 3 stages, is described. One animal was fed on a diet of liver for 2 weeks before the final operation. Except that convulsions were more marked the results did not differ from those in other animals. In 2 animals the  $\text{CO}_2$ -combining power of the plasma was detd. just before operation and again after the onset of the moribund condition. In both instances it was initially rather high and decreased slightly after operation but not enough to account for any of the symptoms. In one animal blood creatinine and in 2 animals urea detns. made before operation and during coma yielded normal values. The clotting time of the blood is unchanged. In 2 expts. bile appeared in the urine and in the plasma after operation. In 3 animals the urine was tested for sugar after operation; sugar was found in one, but it disappeared before death. In one expt. the blood sugar, detd. at various periods after operation, progressively decreased to less than half its normal value. A method is described for the total removal of the liver of a dog without complicating factors other than the anesthetic.

H. V. ATKINSON

**The non-dialyzable constituents of human urine.** H. PRIERAM AND G. HERRN-REISER. *Biochem. Z.* **111**, 30-8(1920).—P. has previously shown that the non-dialyzable portion of human urine possesses a biol. activity. The present report is an attempt to answer the questions as to the action of this residue in acute animal studies, and as to what constituent of the urinary colloids is the carrier of the active principle. The injection of the non-dialyzable portion into the ear-vein of rabbits invariably causes miosis and quite often a condition of somnolence with diminished reflex activity. This action is due to an org. colloid present in urine. Kymographic records show that a prolonged fall in blood-pressure is caused by the substance. The rectal temp. is unaffected. Coagulation *in vitro* is insignificantly retarded and red blood corpuscles are but slightly hemolyzed. The N content of the dried substance is close to that of protein (15.3%). When the colloid is pptd. with  $\text{AcOH}$  the filtrate is physiol. active and gives the usual protein reactions, while the ppt. is inactive. Since it contains no purine bases the origin cannot be directly from nuclear activity but is probably derived from the blood. Complete protein pptn. yielded a still active filtrate which gave no test for peptones or albumoses.

F. S. HAMMETT

**The physiology of blood-sugar. IV. The distribution of glucose between plasma and red blood cells.** RICH. EGE. *Biochem. Z.* **111**, 189-218(1920); cf. *C. A.* **15**, 111.—E. gives tables showing the results of his analyses on the distribution of glucose between plasma and red corpuscles of the blood of the goat, sheep, rabbit, dog and man. He attacked the problem by studying the glucose concn. in plasma and corpuscles on complete and partial glucose satn. (by dialyzing glucose-containing plasma against glucose-containing corpuscle juice) and the glucose distribution after treatment with formol. In complete satn. the glucose distribution relation is the same as is the  $\text{H}_2\text{O}$  partition. The dialysis method gave no satisfactory results owing to the inability to reach an equil. within a reasonable length of time. After the formol treatment the concn. in plasma and corpuscles was not the same. In the goat, sheep and rabbit the blood corpuscles contain no glucose; in the dog they hold about  $\frac{1}{2}$  as much as is found in the plasma while in man the concn. is  $\frac{1}{4}$  that of the plasma. If glucose is added to the blood of the goat, sheep, rabbit and dog the greater part remains in the plasma; since glucose is sol. in the red blood corpuscle contents, it must then be that in these animals the blood corpuscles are impermeable to sugar. This impermeability is destroyed by treatment with formalin.

F. S. HAMMETT



Gas exchange in boys. GERTRUD BAUMGARDT AND MARIA STREUBER. *Biochem. Z.* 111, 83-90(1920).—Respiration studies were made on 2 boys, 11 to 13 years old, and a brief table is given of the results obtained during complete rest. The values averaged 36.7 cal. per kg., 907.8 cal. per sq. m. of body surface and the respiratory quotient ranged from 0.88 to 1.005. The former figures are smaller than is usually found in the literature.

F. S. HAMMETT

Remarks on the "residual reduction" of the blood. JOH. FEIGL. *Biochem. Z.* 112, 51-4(1920).—Polemical concerning the article by Ege (*C. A.* 15, 111).

F. S. HAMMETT

The effect of the thymus and the mammary on menstruation. A. JACOBY. *N. Y. Med. J.* 113, 243-5(1921).—Ovarian inhibition is not sufficient alone to influence menstruation, since ext. of thymus alone fails to cause any change. Combined ovarian and mammary or thymic ext. activity are better than either alone.

F. S. HAMMETT

Cholesterol cycle. A. CHAUFFARD, C. LAROCHE AND A. GRIGAUT. *Ann. de med.* 8, 149(1920); *J. Am. Med. Assoc.* 76, 273.—The authors confirmed their previous assertion that the suprarenals are the source of cholesterol and there appears no doubt that the suprarenals control the cholesterol content of the blood. In the suprarenals from 68 cadavers the cholesterol content ranged from 1.18 to 82.8 g. per kg. The suprarenals function most actively when the organism has most need of lipoids, as in pregnancy. Bile contains the most cholesterol in the pregnant, next in pneumonia, tuberculous meningitis, chronic nephritis and diabetes, all above the normal standard (1.5), the range being 1.95 to 7.5. The liver eliminates and transforms far more cholesterol than is contained in the bile. Cholesterol is oxidized more completely in liver than in other tissues, passing beyond the oxysterols. At present no means is known for influencing the cholesterol cycle or modifying the functioning of the suprarenals.

L. W. RIGGS

Participation of cell nuclei in the phenomena of secretion. Anticoagulating properties of nucleic acid of the intestines. DOYON. *Compt. rend.* 171, 1402-3(1920).—The anticoagulating substance secreted by the organism under the influence of peptone, atropine, morphine, etc., has its origin in the cell nuclei and may be extd. from any organ. Nucleic acids extd. from the intestines of the dog and horse by the method of Neumann are shown to have anticoagulating powers without hemolysis. Nucleic acids prepd. by the method of Jones give the same result.

L. W. RIGGS

Chemical heat regulation. G. MANSFELD AND LUDWIG V. PAP. *Arch. ges. Physiol.* 184, 281-93(1920).—The sugar consumption of the isolated heart of normal

The presence of phosphates in human blood serum. XI. Hyperphosphatemia and "salt retention" in Bright's disease. JOH. FRIGL. *Biochem. Z.* 111, 108-14 (1920); *cf. C. A.* 14, 2650.—Nothing definite or new. F. M. HAMMERT

Adenoma of the thyroid with hyperthyroidism (thyrotoxic adenoma). History of the recognition of this disease as a clinical entity. A study of the symptomatology with basal metabolic rates. WALTER M. BOOTHBY. *Endocrinology* 5, 1-20 (1921).—The syndrome associated with hyperthyroidism from adenoma of the thyroid is considered to be a distinct clinical entity and is characterized by an increased basal metabolic rate. The underlying cause that stimulates the thyroid to adenomatous growth and over-secretion is not known. Detailed metabolic rate and blood pressure studies are reported in 75 cases of the disorder, in which the av. basal metabolic rate before treatment was +35% and after operation +7%. Similar studies of 201 cases before treatment are also given in which the av. basal metabolic rate was +28%. In contrast the av. basal metabolic rate in 167 cases of adenoma without clinical evidence of hyperthyroidism was +2%. Three groups of exophthalmic goiter cases of varying degrees of severity were studied. In 36 patients with the severest type of the disease the metabolic rate before treatment was +66%; after rest in bed and ligations the rate fell to +50%; within 2 weeks after thyroidectomy the rate had dropped to +19%. Similar results were obtained in the other groups. F. S. HAMMERT

A case of dystrophia adiposogenitalis. F. G. EBAUGH AND R. G. HOSKINS. *Endocrinology* 5, 21-8 (1921).—A complete case report of a patient with dystrophia adiposogenitalis in whom amelioration of mental and physical conditions were obtained by a combined thyroid, adrenal and pituitary medication. F. S. HAMMERT

Report on five thousand bloods typed using Moss's grouping. WILLIAM L. CULPEPPER AND MARJORIE ABLESON. Parke, Davis and Co., Detroit. *J. Lab. Clin. Med.* 6, 276-83 (1921).—Without exception the entire 5000 sera could be classified on the basis of agglutination of corpuscles of one group by sera of another, in the 4 groups postulated by Moss (*Bull. Johns Hopkins Hosp.* 21, 63 (1910)), the proportion of sera found in the different groups agreeing rather closely with that found by Moss.

E. R. LONG

Variation in the cholesterol content of the serum in pneumonia. HAROLD A. KIPP. Univ. Pittsburgh. *J. Biol. Chem.* 44, 215-37 (1920).—"The cholesterol content of the blood serum in pneumonia exhibits the following variations: (a) A primary hypocholesterolemia, the degree of which is dependent upon the degree of lung involvement and the intensity of the infection. (b) A secondary hypercholesterolemia in the period of convalescence, during and continuing for a varying period of time after the resolution of the pneumonic exudate. (c) A return to the normal cholesterol content of the serum. The variation in the cholesterol in the blood serum in pneumonia is dependent upon the activity of the leucocytes. Being transported by them to the area of acute inflammation, it acts as an antitoxic substance, neutralizing the bacterial toxins and those arising from the disintegration of tissue in the process of the inflammatory reaction. It may also serve as an adjuvant in the development of antigens which initiate the process of resolution of the pneumonic exudate. The utilization of cholesterol in acute toxic infections is directly proportional to the severity of the disease. The development of empyema definitely alters the variation of cholesterol in the serum in pneumonia." The hypocholesterolemia is more marked than in uncomplicated pneumonia and the return to the normal figure is delayed, indicating an increased utilization with the extension of the inflammatory process. A. P. LOTHROP

Rigor mortis in smooth muscle and a chemical analysis of fibromyoma tissue. EDWIN F. HIRSCH. St. Luke's Hosp., Chicago. *J. Biol. Chem.* 43, 297-306 (1921).—Recorded studies of rigor mortis have been made almost exclusively on skeletal muscle and whatever conclusions there may be regarding its occurrence in smooth

muscle have been reached largely by inference from such studies rather than by actual exptl. observations. By a study of operatively removed uteri and fibromyomas H. observed a postoperative rigor in the smooth muscle similar to the post-mortem rigor of striated muscle. The contraction of the muscle is accompanied by a distinctly increased acidity of the tissue which develops rapidly to a max. and is closely paralleled by a rapid diminution of its reducing carbohydrates and a decrease in alk. reserve. A fairly uniform max. acidity of  $p_H$  6.0 occurs in fibromyomas, part of which at least is due to lactic acid. A chem. analysis of fibromyoma tissue is given. A. P. L.

An investigation of the metabolism in infantile atrophy, with special reference to the respiratory exchange. G. B. FLEMING. *Quart. J. Med.* 14, 171-85(1921).—The respiratory quotients of atrophic infants do not suggest that their tissues are unable to utilize either fats or carbohydrates. The heat output of normal infants resting but in the absorptive state is between 50 and 60 calories per kg. per day. Infants whose wt. is more than 65% of the normal for their age have as great a heat output as normal children. Those whose wt. is less than 65% of the normal have a less than normal heat output and the heat output gradually diminishes as the difference between observed and normal wts. increases. It is suggested that in the first stages of atrophy the loss in weight takes place at the expense of metabolically inactive tissues, but that as atrophy increases there is wastage of metabolically active tissues. The failure to thrive may be caused not by the inability of the organism to utilize any of the proximate principles of the food but by gastrointestinal disturbances leading to defective absorption, especially of carbohydrates. JOHN T. MYERS

The reaction of the spinal fluid during cerebrospinal fever. C. SHEARER AND T. R. PARSONS. *Quart. J. Med.* 14, 120-4(1921).—Rigorous precautions are necessary in removing spinal fluid to avoid contact with air; otherwise the  $p_H$  will be much higher. In meningococcus meningitis the  $p_H$  may sink to 6.9 with an alkali reserve of 0.010 N. This acidosis as compared with that in other meningeal infections is probably due to the ease with which the meningococcus attacks the sugar in the spinal fluid, with the formation of lactic acid. This may explain the difference in clinical symptoms in different cases. If the organisms are few in number or the sugar content of the spinal fluid is low, the resulting low acidosis may cause only mild clinical symptoms. JOHN T. MYERS

The estimation of sugar tolerance. H. McLEAN AND O. L. V. DE WESSELOW. *Quart. J. Med.* 14, 103-19(1921).—The estn. of the sugar tolerance by examn. of the blood sugar at varying intervals after the ingestion of the carbohydrates is the only means by which a satisfactory graphic representation of the condition of the carbohydrate-storing mechanism can be obtained. The test has a definite use in detecting minor deviations from the normal which may constitute the earliest warning of the development of diabetes. It is probable that the most important defect in diabetes is the failure of some mechanism by which sugar is abstracted from the blood and stored. JOHN T. MYERS

Certain effects of peptone injections in septicemia. A. E. GOW. *Quart. J. Med.* 14, 187-204(1921).—The intravenous injection of Witte peptone in therapeutic doses produces an immediate rise in the pulse frequency, fall in blood pressure, leucopenia, diminution of the coagulation time of the blood, all of short duration. These phenomena are all more marked in patients with leucocytosis. A tolerance to peptone, as regards pulse and blood pressure is soon established but is of short duration. The polymorphonuclear leucocytes show a rapid fall followed by a slower rise. The fall of the lymphocytes is proportionately less, is relatively delayed, and may be preceded by a rise. The leucopenia is followed by a transient polymorphonuclear leucocytosis. The changes are similar in kind to those following the intravenous injection of colon-typhoid vaccc. but peptone has a less stimulating effect on the bone marrow. J. T. M.

## H—PHARMACOLOGY

ALFRED N. RICHARDS

**Blood changes in lead workers.** ARTHUR SELLERS. *J. Ind. Hygiene* 2, 361-7 (1921).—The presence of punctate basophil granules in the red blood corpuscles of workmen exposed to lead is by no means conclusive evidence of lead poisoning, for they occur in normal exposed and unexposed persons, and were not especially marked in some cases which clinically showed poisoning. "A blood examination in a case of suspected lead poisoning is only one of numerous other pieces of evidence which must all be considered critically in order to arrive at a diagnosis." JEROME ALEXANDER

**Pitralon.** HAHN AND F. HANEMANN. *Münch. med. Wochschr.* 67, 934-5 (1920).—Pitralon is a combination of pitral, a colorless prepn. obtained from pine tar, with halogenated hydrocarbons. It is a light yellow fluid. Severe cases of deep trichophytosis were readily cured. S. AMBERG

**Effect of therapeutic doses of mercury on the kidneys and the duration of its excretion.** L. G. BEINHAEUFER. Univ. Michigan. *Am. J. Med. Sci.* 159, 897-9 (1920).—The excretion of calomel in ordinary therapeutic doses begins within 6 to 12 hours and is continued until the 6th day, depending upon the size of the dose. A small dose of the drug is excreted as rapidly as a larger dose, but over a shorter period of time. Insofar as could be detd. by the urine analysis the drug is excreted without injurious effects upon the kidney. H. V. ATKINSON

**Paradoxical action of adrenaline on the pupil of the eye in animals after repeated treatment with that drug.** TOYOJIRO KATO AND MASAO WATANABE. Tohoku Univ. *Tohoku J. Exp. Med.* 1, 73-82 (1920).—In cats which were previously treated with daily successive hypodermic injections of adrenaline for some weeks the administration of a minute quantity of adrenaline into the carotid gives rise to constriction of the pupil, while by intravenous injections no such paradoxical effect is obtained. This reversed action cannot be imitated by elec. stimulation of the cervical sympathetic nerve. It fails also after removal of the superior cervical sympathetic ganglion. In the pupil of such treated animals constriction is usually observed after the instillation of adrenaline. The paradoxical action of adrenaline on the pupil occurs only rarely in animals previously not treated with repeated administrations of adrenaline. In animals previously treated daily for some weeks with successive instillations of adrenaline instead of hypodermic administrations the instillations of adrenaline are always followed by weak miosis lasting for 5-8 hrs. The instillation of cocaine or pituitrin provokes distinct mydriasis in the previously treated eye and of physostigmine less marked miosis in the eye on this side than in that on the non-treated side. The paradoxical action is based probably on the altered chemism of the dilator muscles of the pupil. H. V. ATKINSON

**Function of the sympathetic nerve supplying the intestine and the action of adrenaline.** KASANO TASHIRO. Tohoku Univ., Sendai. *Tohoku J. Exp. Med.* 1, 102-5 (1920).—It is probable that in this nerve there exists besides the inhibitory nerve fibers the augmentatory nerve fibers, and that the circular muscle is supplied by the latter, and the longitudinal muscle is supplied by both of these nerve fibers. Adrenaline stimulates these nerve endings (neuromuscular junction), and whether it excites or inhibits depends upon its quantity. H. V. ATKINSON

**Correlation between the chemical composition of anthelmintics and their therapeutic values in connection with the hookworm inquiry in the Madras Presidency.** Oleum cajuputi. J. F. CAINS AND K. S. MHASKAR. *Indian J. Med. Research* 7, 722-6 (1920).—A review and some expts. with the conclusion that oil of cajuputi cannot be recommended as an anthelmintic. H. V. ATKINSON

**Chaulmoogra oil in leprosy.** T. A. HENRY. *J. Trop. Med. Hyg.* 23, 249-50 (1920).—A review. H. V. ATKINSON

The action of tartrate of antimony in intravenous injections: the permeability of bilharzia ova and some protozoal organisms. J. B. CHRISTOPHERSON. London. *Brit. Med. J.* 1920, II, 854-5. The resistance of bilharzia to Sb tartrate is in the ascending order, worm, ova, miracidia. Expts. *in vitro* show that the action is direct, and that the miracidium is killed inside the shell.

A. T. CAMERON

Antimony in leprosy. F. G. CAWSTON. Durban. *Brit. Med. J.* 1920, II, 855-6. —A further report of the beneficial effects of injections of Sb (Oscol stibium). *Cf. C. A.* 14, 3108.

A. T. CAMERON

The use of sodium morrhuate in pulmonary tuberculosis. MAX BIESSENTHAL. Chicago-Winfield Sanatorium. *Am. Rev. Tuberc.* 4, 781-3 (1920). —A total of 430 injections of Na morrhuate (Rogers, *Brit. Med. J.* 1919, 147; *cf. C. A.* 14, 798) were given to 25 patients with incipient and moderately advanced pulmonary tuberculosis. The av. time of treatment was 4 months. B. could notice no effect of the treatment upon the sputum, wt., temp., or physical signs and agrees with Rogers that Na morrhuate is not a specific for tuberculosis but does not agree with him that it is the best line of treatment for tuberculosis in general.

H. J. CORFER

The development of chemotherapy. P. KARRER. Zurich. *Schweiz. Chem.-Ztg.* 40, 481-91 (1920). —Chemotherapy has developed as a science only in the last twenty years. The science is not well named for it does not apply to every form of therapy in which chemicals are used but only to those in which they are used as specifics for certain types of infection—the disinfection of the infected organ by chemical agents. It is a sister science to serum therapy and may approach the latter more closely, but is not yet nearly so specific in its application to the infecting agent. Chemotherapeutic agents may be classified according to their chemical properties or to their similarity in action or the two methods may be combined. Salicylic acid derivs., as aspirin, atophan and hexophan, have a selective affinity for the joints and thus favorably influence arthritis and gout. They combine with the heavy metals to form salts in which the metal is completely masked. Their action on parasitic organisms may be similar. The silver compds. have a similar selective action on the gonococcus which, however, is not limited to it but attacks also the albuminous tissue. Colloidal silver has eliminated the latter feature. Arsenicals are the classical examples in chemotherapy. The cacodyl compds. are specific in their action in skin diseases only by reason of their arsenic content. Atoxyl and its less toxic derivs., arsacetin and arspbenamine, are specific against certain typanosome and spirochetal infections but fail in some instances. Silver arspbenamine is extraordinarily selective for spirochetal infections, the copper compd. for trypanosoma, partially effective for sleeping sickness. Mercury compds. are given little consideration because they are not specific. Certain dyes, especially the benzidine and trypanosan compds., have specific action for trypanosomes and act more strongly in a serum medium. The quinine alkaloids are classical in their action in fevers, particularly malaria. The base cupreine, of which quinine is an ether, is the starting point of a number of active derivs. of considerable importance but apparently rigidly specific. Quinotoxin is wrongly named as it is only slightly toxic.

H. C. HAMILTON

The action of carbon monoxide. M. KOCHMANN. *Biochem. Z.* 111, 39-44 (1920). —K. studied the effects of CO, CO plus CO<sub>2</sub> and illuminating gas on the frog. An atm. of pure CO caused the animal to lose its reflexes in about 2 hrs. Recovery occurred quickly when the frog was put in ordinary air. Paralysis occurred when pure H<sub>2</sub> was used. Tadpoles and the isolated frog heart were not injured by pure CO, but when CO<sub>2</sub> was added to the CO not only the animal as a whole but also individual organs showed evidences of reversible paralytic effects. In illuminating gas frogs were irreversibly paralyzed in 20 min. The rapidity of the onset of paralysis was in part related to the CO content. The irreversibility depended upon substances that are absorbed by Br-water, e. g., C<sub>2</sub>H<sub>4</sub>.

F. S. HAMMETT

**Codeine derivatives (eucodal and paracodeine).** J. BRAGAZZIO. *Biochem. Z.* 111, 91-104(1920).—B. tested out on rabbits the response to repeated administration of codeine derivs. in an attempt to det. whether or not these animals become habituated to their use; the respiratory changes were used as an index of the action. It was found that eucodal paralyzes the respiration much more than does morphine or paracodeine, but is less poisonous than heroine. The general narcosis is deeper but less lasting than under morphine. No evidence was obtained tending to show that rabbits were becoming accustomed to the drug, though dogs apparently are more resistant. Paracodeine was more effective than codeine but less so than morphine. Dogs showed a tendency to become accustomed to the sedative components of the drug. Both drugs paralyze the isolated rabbit-gut.

F. S. HAMMETT

**The actions of poisons.** Study of the action of thiodiglycol and its derivatives on soy-bean urease. P. RONA AND H. PETOW. *Biochem. Z.* 111, 134-65(1920).—This report includes a study of the stability of some derivs. of thiodiglycol in  $H_2O$  as measured by cond. expts. Curves are given showing the rate of decompn. and liberation of free acid of thiodiglycol, thiodiglycol acetate and sulfonate, of dichlorodiethyl sulfide and tetrachlorodiethyl sulfide. The poisonous effect of these compds. on urease activity was studied under conditions of exact regulation of the H-ion concn. Thiodiglycol and its acetate are not poisonous and they do not alter the H-ion concn. of the soln. The sulfonate is markedly toxic although it does not influence the reaction of the soln. Di- and tetra-chlorodiethyl sulfide both produce marked changes in the H-ion concn. of the solns. The former in small amts. has only a slight inhibiting effect on urease when the reaction is regulated, while the latter under similar conditions prevents urease action completely.

F. S. HAMMETT

**The oligodynamic action of metals.** D. ACÉL. *Biochem. Z.* 112, 23-6(1920).—The germicidal action of Ag is due to its soly. in  $H_2O$ . This A. claims to prove both indirectly and directly, in that he found Ag in  $H_2O$  which had been treated with the metal, by evap. the soln. in a white porcelain dish to dryness, and adding to the residue dil.  $(NH_4)_2S$ . The indirect evidence presented is that no germicidal activity is produced when  $H_2O$  which has been treated with Ag has added to it a small amt. of  $(NH_4)_2S$ .

F. S. HAMMETT

**Experimental studies of the properties of surviving vessels as tested by chemical methods of stimulation.** L. E. ROTHLIN. *Biochem. Z.* 111, 219-56(1920).—This first paper is mainly concerned with a description of the conditions regulating the proper conduction of expts. for the study of vaso-active compds. on isolated blood vessels which lead to the conclusion that such material is quite suitable for qual. work where high sensitivity is required. II. The action of some chemical vaso-tonic substances of organic nature. *Ibid* 257-98.—Using the isolated blood vessel as the test-organ R. was unable to demonstrate the presence in normal blood of any vaso-tonic substance besides adrenaline with any safe regularity, although in blood serum there is found a vaso-constrictor substance which is not adrenaline. Adrenaline action was then tried out on various blood vessels from different organs and different animals. The irritability of the renal vessels towards adrenaline is the same as is that of the others studied; they can be constricted or dilated at will by the drug depending on the dose employed, and both the proximal and the distal portions react in the same way. However, on the coronary vessels a qual. and quant. difference is obtained. The coronary vessels from the equine type are contracted. In the bovine type weak concns. cause a weak contraction, while stronger doses, i. e., after a latent period, bring about a dilation. The vessels from swine and sheep act similarly. On the isolated lung vessel of both equine and bovine type adrenaline in normal doses produces contraction. III. *Ibid* 299-335.—This third and last paper first takes up the effect of  $\beta$ -imidazolylethylamine in the same manner in which adrenaline was studied. Apparently there

exists a qual. difference in the action of histamine on different surviving blood vessels. Arterial strips from various sources from various kinds of animals, as well as the vessels of the rabbit ear, are regularly contracted by the compd. in concns. in which adrenaline has a similar action. All the vessels of the frog, however, are inconstant in their response and the effective doses are from 10 to 100 times as weak. Pituglandol is also inconstant in the type of its reaction on the frogs though it constricts the vessels of the rabbit ear. Lienin, a prepn. from the spleen, acts as a vaso-constrictor on the isolated segment of the vessels that are capable of being so influenced. These effects on the isolated blood vessel strips are in general quite comparable with those obtained *in vivo*, and serve to demonstrate that the latter are largely the results of the response of the tissue itself and are not due to mediation through extraneous sources.

F. S. HAMMETT

**Oligodynamic hemolysis.** W. HAUSMANN AND W. KERL. *Biochem. Z.* 112, 122-3(1920).—When various finely divided metals, such as Ag, Cd, Cu, Mg, Ni, Pb, Sn and Zn, are applied to blood-agar plates, there are produced local areas of hemolysis of the corpuscles in the agar.

F. S. HAMMETT

**Intravenous sodium carbonate treatment of novarsenical colloidclasia.** SICARD AND PARAF. *Bull. mem. soc. med. hop. Paris* 45, 11-6(1921).—The "shock" resulting from the intravenous administration of the novarsenicals is attributed to a disturbance of the colloidal state of the body fluids. The authors observed that the injections of sterile solns. of  $\text{Na}_2\text{CO}_3$ , which had been kept in containers of soft glass, were frequently followed by similar phenomena. This they attribute to the products of the reaction of the  $\text{Na}_2\text{CO}_3$  on the glass, since when solns. from hard-glass containers were used no such after-effects were obtained. When 30 cc. of physiol. saline soln. containing 0.6 to 0.7 g. of  $\text{NaHCO}_3$  are injected intravenously just before the administration of the novarsenical no untoward results occur. *Ibid* 60-5.—A continuation of the studies by a series of lab. investigations showed that a preliminary injection of  $\text{NaHCO}_3$  prevented the subsequent pptn. of horse serum *in vitro* by the serum of the injected subject.

F. S. HAMMETT

**Studies on the action of various salts on the liver after their introduction into the duodenum.** MAX EINHORN. *N. Y. Med. J.* 113, 313-21(1921).—Bile mixed with 5%  $\text{MgSO}_4$  does not change its color but increases its sp. gr. from 1.013 to 1.055.  $\text{Na}_2\text{SO}_4$  raises the sp. gr. from 1.013 to 1.030 while Na phosphate raises it from 1.012 to 1.021. The salts were given in different strengths in 60-cc. doses to patients by injection into the duodenum in the fasting condition on different days. Charts and protocols are given of several of the expts. in which these and other salts were administered. The general conclusion of the study is that  $\text{MgSO}_4$  and  $\text{Na}_2\text{SO}_4$  stimulate the liver to increased activity.

F. S. HAMMETT

**A lipotropic mercury compound.** HANS HÜSGEN. *Biochem. Z.* 112, 1-22(1920).—H. describes in some detail a method for the detn. of Hg in brain material. The first step consists in completely destroying all org. matter by digesting the material in a flask provided with a reflux condenser with HCl and  $\text{HClO}_3$ , and final destruction with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ . The residual soln. is brought to a vol. of 125 to 150 cc. after neutralizing with concd.  $\text{NH}_4\text{OH}$  or 50% NaOH, and the Hg detd. by electrolysis. A lipotropic Hg prepn. from a commercial house was fed to several animals and the Hg of the nervous system and musculature detd. The results indicate that this prepn. is better utilized than other commonly used products.

F. S. HAMMETT

**Poisoning with American oleum chenopodii anthelminthici.** ALOYSIUS PREUSCHOFF. *Z. exp. Path. u. Ther.* 21, 425-43(1920).—A review and analysis of the reported cases of poisoning by oil of worm seed.

F. S. HAMMETT

**Atropine in Menière's vertigo.** IDE. *Bull. acad. roy. méd. Belg.* 30, 866-8(1920).—Central, as well as peripheral vagotonia, is involved in this condition, in which atropine is very effective.

M. HEIDELBERGER

**Decomposition of propionic acid in the animal body.** LÉON BLUM AND PIERRE WORINGER. *Bull. soc. chim. biol.* 2, 88-95(1920).—Lactic and pyruvic acids were found in the urine following the administration of propionic acid to dogs and rabbits. These products probably arise in the body by oxidation of the  $\alpha$ -C atom of the injected acid. The authors compare this with the oxidation of the  $\alpha$ -C atom in the degradation of the  $\alpha$ -amino acid mol. in the animal organism. The question whether lactic acid or pyruvic acid is the first to be formed is fully discussed, but an opinion is postponed until further researches have been completed.

J. C. S.

**The chemotherapy of septic diseases with silver-dye compounds.** ERICH LÄSCHKE. *Berlin. klin. Wochschr.* 57, 79-81(1920).—Reports favorable results with argo-flavin (tryptaflavin-Ag) and argochrome (a methylene blue-Ag compd.) in septicemia.

JULIAN H. LEWIS

**The disinfectant action of several silver preparations.** H. BERNHARD. *Darmstadt. Centr. Bakt. Parasitenk., Abt. I* 85, 46-62(1920).—The 4 preps. studied were argochrome, choleval, protargol and collargol. Argochrome is the product of the reaction of methylene-blue nitrate and  $\text{AgNO}_3$ . Choleval is a colloidal Ag prep. with Na gallate as the protective colloid. Protargol is an Ag-protein compd. Collargol is a colloidal Ag prep. prep. by reducing  $\text{AgNO}_3$  with  $\text{Fe}_2(\text{SO}_4)_3$  in the presence of  $\text{NH}_4$ -citronic acid. Argochrome has the highest disinfectant action, choleval stands second and protargol third. The Ag content of a prep. is no criterion of its antibacterial action. With the exception of collargol, these preps. are reduced in their activity in NaCl-containing media. All 4 preps. are reduced in activity in media containing protein. Choleval and collargol are least affected. Choleval seems to be best suited for treating diseased mucus membranes. Argochrome owes its action to the  $\text{AgNO}_3$  it contains, while the dye component protects it from pptn. by chlorides. No ppt. is formed with serum. This is because the serum acts as a protective colloid and colloidal Ag is produced. This explains why argochrome can be given safely intravenously.

JULIAN H. LEWIS

**The bactericidal action of urotropine.** TOSHINOBU OHIRA. *Utrecht. Centr. Bakt. Parasitenk., Abt. I* 85, 63-8(1920).—Urotropine itself has no bactericidal or growth-inhibiting action. In ammoniacal decomp. of urine the growth of the bacteria is inhibited because of the alkalinity of the urine.

JULIAN H. LEWIS

**Bromine and chlorine existing normally in animal tissues.** A. DAMIENS. *Compt. rend.* 171, 930-3(1920).—Br was estd. by a method previously reported (*C. A.* 15, 219, 867) in various tissues of the ox, dog, pigeon, partridge, fowl and man, with the following results: Br was present in all of the organs examd. except in those cases in which the wt. of organ treated was so small that the amt. of Br was outside the limits of sensibility of the method used. Thus in 5 tests upon the thyroid gland of dogs, and one each upon the medulla and suprarenals, the amt. of Br was "insensible." Cl was detd. in each tissue, the amt. ranging from 55 mg. in dog muscle to 348 in ox lung per 100 g. of fresh tissue. Even greater variations occurred in the body fluids. Br in solid tissues varied from 0.05 in fowl's liver and kidney to 0.84 mg. in pigeon's lungs. The ratio of Br to Cl in 3 ox tissues averaged 0.00123, in 20 dog tissues 0.00184, in a second dog 0.00156, man 0.00113 and 0.00145. It appears demonstrated that Br is generally a normal constituent of animal tissues. (Cf. following abstract.)

L. W. RIGGS

**Toxicological study of toxic bromine.** A. DAMIENS. *Compt. rend.* 171, 1021-3 (1920); cf. preceding abstract.—In the organs of a large number of dogs poisoned with benzyl bromide, bromoacetone, etc., the amt. of Br found was 2 to 5 times the normal amt. An examn. of 367 cadavers of persons killed by various toxic gases showed the constant presence of Br, the av. for lung tissue in 362 cases being 0.30 mg. per 100 g. of organ, and Cl in 151 cases was 260 mg., giving a ratio Br/Cl of 0.00140. An inde-



pendent series of detns. gave a ratio of 0.00084. These figures furnish an approx. basis for the detn. of death by Br poisoning. The highest figures observed in Br poisoning were 1.9 mg. Br and 341 Cl per 100 g., and the highest ratio Br/Cl was 0.00386. In all cases the intoxication was accompanied by extensive edema and it is not always possible to det. whether the Cl is from the poison gas or from the liquids of edema which are richer in Cl than the lung tissue.

L. W. RIGGS

New preparations which hasten the coagulation of blood. NONNENBRUCH AND W. SZYSZKA. *Wurzburg. Deut. Arch. klin. Med.* 134, 174-84(1920).—Ethylenediamine in certain acid combus., as acetic-acid ethylenediamine, theophylline-ethylenediamine (euphyllin) and diethylenediamine are clinically useful because of their action in markedly accelerating the coagulation time of blood. Caffeine and theophylline alone have these properties to some extent. These substances, in contrast to the usual clinical methods which are active only for 1 to 1½ hrs., have an action for several hours. In the most active expts. the acceleration was over 50%. These substances inhibit coagulation *in vitro*. Their action in the body apparently rests on an increase of the fibrin ferment. There is no reason to believe that their action depends on a toxic action. There is probably an action on the spleen because in several rabbits from which the spleen was removed euphyllin had no action. Several cases of hemoptysis were improved by the intravenous injection of 0.48 g. of euphyllin. J. H. L.

Quinidine therapy. ROUARD SCHÖRR. *Univ. Köln. Deut. Arch. klin. Med.* 134, 208-18(1920).—Studying the effect of quinidine on the guinea pig heart by means of the electrocardiograph S. found a progressive decrease in the rate of contraction of the auricles, a broadening and blunting of P, the formation of a deep S, marked enlargement of T, which occasionally proceeds to a short-lived flattening, lengthening of the conduction time, a falling out of the ventricular systole to a 5th without interference with the ventricle automaticity.

JULIAN H. LEWIS

The fate of India ink injected in the blood. I. General observation. K. NAGAO. *John McCormick Inst. of Infect. Dis., Chicago. J. Infect. Dis.* 27, 527-38(1920).

JULIAN H. LEWIS

Experimental streptococcus empyema. II. Attempts at dye therapy. F. P. GAY AND L. F. MORRISON. *Univ. Cal. J. Infect. Dis.* 28, 1-17(1921).—Test-tube expts. with a no. of dyes gave promise that they could be used in the treatment of exptl. streptococcus empyema. Actual tests, however, made with acriflavine, the most favorable dye, showed that while this substance may completely sterilize the contents of an infected pleural cavity, reinfection occurs. The results do not justify anticipation of practical therapeutic results from the use of dyestuffs in empyema due to the streptococcus.

JULIAN H. LEWIS

The action on the gonococcus of sodium oleate, alone and in combination with other drugs. DAVID M. DAVIS AND ERNEST O. SWARTZ. *Johns Hopkins Univ. J. Urol.* 4, 409-18(1920).—Na oleate has a definite germicidal value for the gonococcus. The value is increased, where uncoagulated protein is present, by the addition of boric acid. The presence of small, sublethal quantities of Na oleate increases the germicidal action of many drugs against the gonococcus. With others it is without effect. Sodium oleate with boric acid is suggested as an adjuvant to other drugs in the treatment and prophylaxis of gonorrhea.

JULIAN H. LEWIS

Hexamethylenetetramine: its quantitative factors in therapy. ALFRED T. SHOHL AND CLYDE L. DEMING. *Johns Hopkins Univ. J. Urol.* 4, 419-35(1920).—Formaldehyde solns. of 1:5,000 to 1:10,000 in 2 hrs., at body temp., will kill 80 to 90% of *B. coli*. The rate of transformation and the amt. of formaldehyde formed from hexamethylenetetramine depend on the H-ion concn. of the urine. The urine must be acid as *pH* 5.4 to obtain 80 to 90% antiseptics in 2 hrs.

JULIAN H. LEWIS

Effect of surgical anesthesia on reaction of blood. J. B. COLLIP. *Brit. J. Exp.*

*Path.* 1, 282(1920); *J. Am. Med. Assoc.* 76, 272.—The rate of elimination of water, acid and basic phosphates and  $\text{NH}_3$  in periods before, during and after anesthesia appears to vary but slightly. C. suggests that the "acidotic process" of Haggard and Henderson is antagonistic to the overventilation process. Whether the  $\text{C}_{\text{H}}$  of the blood rises or falls during surgical anesthesia depends upon the relative intensities of these two processes.

L. W. RIGGS

**Properties of lacrymogenic substances and the measure of their activity.** GABRIEL BERRYRAND. *Compt. rend.* 171, 965-7(1920).—B. comments on the work of Bongrand and Dufraisse, *C. A.* 15, 398, and discusses the factors involved in the attempt to deduce quant. results by the procedure employed. The various substances do not behave alike in many respects. Thus chloropicrin acts suddenly and but slowly increases its intensity on prolonged contact. Monochloroacetone acts with progressively increasing intensity. The differing actions of these agents is ascribed to their varying soly. in the aqueous liquids of the eye. Exposure to these chemicals for 30 sec. and then for 3 min. may lead to opposite conclusions as to their lacrymogenic power.

L. W. RIGGS

**Shock occurring by the introduction of insoluble substances into the circulation.** AUGUSTE LUMIERRE AND HENRI COUTURIER. *Compt. rend.* 171, 1172-4(1920).—Pure  $\text{BaSO}_4$  suspended in isotonic artificial serum, each cc. containing 0.0265 g.  $\text{BaSO}_4$ , was injected into the carotid of a dog in a 10 cc. dose and into the left heart of a guinea pig in a 1 cc. dose. In both animals the characteristic phenomena of anaphylactic shock followed, and the animals showed the same histopathologic lesions and congestions as in true anaphylaxis.

L. W. RIGGS

**Mechanism of the action of morphine on the coagulability of the blood.** DOYON. *Compt. rend.* 171, 1236-7(1920).—Both morphine and atropine, though very unlike in chem. constitution, prevent coagulation of the blood in a manner similar to that of peptone. Morphine is inactive *in vitro*, but injected into a mesaraic vein of the dog renders the blood uncoagulable for 2 to 3 hrs. During this phase the blood when drawn will prevent the coagulation *in vitro* of normal blood of another dog. This property is due to the presence in the plasma of a nucleoprotein secreted principally by the liver of the organism under the influence of morphine, and may be isolated by the method of Doyon, Morel and Policard, *C. A.* 5, 2115-6. A dose as small as 3 cc. of a 1% soln. of morphine hydrochloride will produce the results in a dog weighing 29 kg. Rabbits and certain individual dogs are refractory. The uncoagulability is generally accompanied by a lowered arterial pressure but it is not proved that the phenomena are interdependent. Codeine may cause uncoagulability like morphine but such action is exceptional.

L. W. RIGGS

**Black spider poisoning.** D. J. LOUIS. *J. Am. Med. Assoc.* 76, 99(1921).—The black spider, common in Mexico, is extremely poisonous. The animal resembles the ordinary spider, is black in color with a few white spots and the body dimensions are 0.5 by 0.25 in. Three or 4 hrs. after a person is bitten a pustular eruption develops, the part swells, there is nausea and vomiting. Treatment consists in applying gauze wet with a satd. soln. of  $\text{MgSO}_4$  to the affected area, and the internal administration of 4 minim doses of I. The  $\text{MgSO}_4$  apparently relieves the pain, reduces the swelling and prevents the progress of the disease. In none of the 4 cases with histories reported were bacteria found in blood or serum, and an examn. of the urine was negative. Blood counts revealed a slight excess of leucocytes.

L. W. RIGGS

**Acute poisoning from nitrous fumes.** F. JACOLET. *Paris médical* 10, 369 (1920); *J. Am. Med. Assoc.* 76, 144.—A man repairing a ventilator to a chem. fertilizer factory was exposed for several min. to nitrous fumes. A general malaise followed which by 20 hrs. developed symptoms suggesting suffocating capillary bronchitis, and by 36 hrs., notwithstanding various remedies were applied, the conditions were desper-

ate. Then a subcutaneous injection of O through a serum needle induced slight improvement. In 48 hrs., more than 80 liters of O were thus injected, forming an emphysema over the entire body to the base of the chest, and the patient rapidly recovered. In Pic and Durand's case a patient was in complete coma but recovered by the subcutaneous injection of O.

L. W. RIGGS

Treatment of poisoning. L. CHEINISSE. *Presse médicale* 28, 858(1920); *J. Am. Med. Assoc.* 76, 144.—C. contrasts the present with the older methods of treatment of poisonings (not corrosions). First, thorough lavage of the stomach with 20 liters of water, then with water containing finely pulverized animal charcoal followed by the introduction of 2 tablespoons of animal charcoal with 30 g. of  $MgSO_4$ . If too late for lavage the charcoal and  $MgSO_4$  are given in 500 cc. of water as soon as possible, through a tube if necessary. The heart must be supervised but charcoal is the antidote. C. claims that charcoal may prove as effectual against endogenous toxins as the exogenous, especially in enteritis, diarrhea, etc.

L. W. RIGGS

Bases of hormone therapy. L. ASHER. *Schweiz. med. Wochschr.* 50, 1057(1920); *J. Am. Med. Assoc.* 76, 209.—Hormones, not being colloids, are able to pass rapidly into the blood and thence into the cells, while the lack of a ferment of protein nature deprives them of any action as antigens. Suprarenal and thyroid hormones are discussed. Organotherapy and hormone therapy are not identical, as with the former there is ballast which may induce undesired reactions. All hormones can be injected by the vein. Thyroid and pituitary hormones exert their action when taken by mouth also. The thyroid or pituitary hormone reinforces the suprarenal hormone while the pancreas hormone has an antagonistic action. Removing the organ producing the hormone may be called negative hormone therapy.

L. W. RIGGS

Relations between blood and organs. K. KOTTMANN. *Schweiz. med. Wochschr.* 50, 1060(1920); *J. Am. Med. Assoc.* 76, 210.—Different serums display a difference in the degree of dispersion which they permit on the addition of a colloid. K. ests. this by generating in the serum a colloidal AgI. The serum is then exposed to light and hydroquinol added. The fluid turns brown or black by a kind of developing process; the rapidity and intensity with which this occurs form an index of the degree of dispersion of the colloid. With serum from exophthalmic goiter patients, the dispersion is extreme. With ordinary goiter there is little dispersion. With 51 cases of cancer of the liver the dispersion was 24 times as great as in 159 controls. Much creatine is eliminated in exophthalmic goiter, and as it easily forms guanidine, this may explain certain symptoms.

L. W. RIGGS

Poisoning with water-glass. H. EICHHORST. *Schweiz. med. Wochschr.* 50, 1081(1920); *J. Am. Med. Assoc.* 76, 275.—A man drank 200 cc. of water-glass by mistake and was seized with a severe gastroenteritis, vomiting, diarrhea and occult bleeding. Albumin, casts, blood, sugar and acetone appeared in the urine. Blood pressure rose to 152 with lymphocytosis and the residual N was 0.073%. Ice pellets, iced milk and acacia, and ice bag to neck were the principal remedies. Owing to its high  $SiO_2$  content, caution should be used in prescribing *Equisetum*.

L. W. RIGGS

Injurious effects of whiskey from sulfite liquors. I. Dangers from sulfite liquors. ASTRID CLÈVE VON EULER. *Svensk Kem. Tidskrift* 32, 195-8(1920). II. Physiological action of compounds containing methyl radicals. SVEN BODFORS. *Ibid* 198-208.—Whiskys from sugars produced from sulfite liquor have found their way into the Swedish market. The question has been raised as to the dangers involved, presumably on account of possible content of MeOH. Mrs. von Euler shows that the fraction containing the MeOH and associated substances amounts to only 1.5%. Of this 0.9 is MeOH. Ten l. of the whisky were redistd. to get this fraction. The second paper is a brief summary of the pharmacol. action of certain compds. with various degrees of satn. of Me and Et radicals. A study by Hammarsten and Lindberger on 6 persons

consuming a 40% whisky from sulfite process carbohydrate showed no unusual harm. According to Langaard (*Berl. klin. Wochschr.* 49, 1704(1912)), MeOH in small doses is more toxic than EtOH but the reverse is true for large doses; this last observation is not corroborated by Pohl (*Arch. exp. Path.* 83, 240). If pure MeOH is relatively harmless the harm noted is attributed to associated aldehydes. AcH is produced at the expense of the MeOH. Giacosa (*Arch. sci. med.* 10, 293) has shown that the toxicity of the AcH increases with the presence of  $\text{NH}_3$ . In the wholesale MeOH poisoning in Berlin (Juckenack, *C. A.* 6, 3490) the MeOH was unusually pure, containing only 0.003% aldehydes. See also Loevy, *C. A.* 12, 2378; Olivari, *C. A.* 7, 2065; Franceschi, *C. A.* 6, 1952; 7, 384; 9, 952.

A. R. ROSE

Arsphenaminized serum in treatment of neuro-syphilis. D. E. PAULIAN. *Presse medicale* 28, 888(1920).—P. describes the technic used by Marenco for treating syphilis by serum of other syphilitics who had been treated with arsphenamine. The efficacy of the treatment is ascribed to the presence of antibodies. The increase of total N in the blood after the injections of arsphenamine is stated to be due in part to the formation of antibodies. The serum should be taken 24 hrs. after the injection in order to obtain the max. amt. of antibodies.

H. A. SHONLE

Quinine tolerance in mammals. S. M. NEUSCHLOSZ. *Arch. ges. Physiol.* 184, 190-210(1920).—Prolonged parenteral treatment of dogs and rabbits with quinine causes a true tolerance, always manifested by an increased capacity of the body to destroy the alkaloid. Oral administration fails to produce a tolerance or a heightened ability to destroy the drug. Animals which have developed a tolerance react to oral administration. The tissue fluids (spleen, kidney, muscle) of tolerant animals, in contrast to those from normal animals, are able to inactivate quinine. Treatment with As impairs the quinine-destroying properties of a tolerant animal, and the presence of As will inhibit the *in vitro* activity of the tissue juices. Arsenic does not influence the destruction of quinine by a normal animal. Obviously there is a qual. difference between normal and tolerant animals as regards quinine destruction. G. H. SMITH

A curious case of carbon monoxide poisoning. ALBERT GASCARD. *J. pharm. chim.* 22, 418-21(1920).—Circumstantial and chem. evidence of rapid fatal poisoning by CO gas, due to poor draft of a coal fire, and the use of an additional open charcoal fire for cooking.

S. WALDBOYR

Urinary elimination of procaine. R. THIEULIN. *J. pharm. chim.* 22, 463-6(1920).—To identify procaine (A) or its components  $\text{Et}_3\text{NCH}_2\text{CH}_2\text{OH}$  (B) and  $p\text{-NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$  (C) in the urine of a rabbit after intramuscular injection of HCl-A, collect the urine after 8, 24 and 48 hrs., sat. it with NaCl, and ext. A and B with  $\text{Et}_2\text{O}$  in alk. medium, then C with  $\text{Et}_2\text{O}$  in acid medium, and apply color tests to each. B turns red in 5 cc. aq. soln. with acetone (10 drops) and 2 cc. K nitroprusside (10%); A is not affected. A and C form a scarlet ppt. on addition of 5 cc. of 5% HCl, 5 drops of 10%  $\text{NaNO}_2$  and dropwise a soln. of 2%  $\beta$ -naphthol in 100 g. of 4% NaOH. During 24 hrs. following the injection, A, B (traces) and C may be detected. During 3 days, the amts. of  $\text{NH}_3$  and amino acids are also notably increased.

S. WALDBOYR

Neoarsphenamine (VAN ITALLIE) 17.

## I—ZOÖLOGY

R. A. GORTNER

Pentose mononucleotides of the pancreas of the dogfish (*Squalus sucklii*). C. BERKELEY. Marine Biol. Sta., Nanaimo, B. C. *J. Biol. Chem.* 45, 263-75(1921).

—The pancreas of the dogfish was selected for investigation because it contained the most pentose of any tissue examd.; and because the pancreas is the classical seat of guanylic acid in mammals and it seemed of interest to det. whether the same compd. occurs in the lower vertebrates. The  $\beta$ -nuceloprotein of the dogfish pancreas is readily hydrolyzed by cold 1% NaOH soln. and contains both adenine and guanine

in pentose mononucleotide combination. These mononucleotides are not pptd. from either neutral or AcOH soln., the guanine mononucleotide differing in this respect from the guanylic acid previously isolated from mammalian material. Inosinic acid is also present but no evidence was obtained that it exists in the tissue in nucleoprotein combination.

A. P. LOTHEROP

Chemistry of the whitefish sperm. VERNON LYNCH. Univ. Cin. J. Biol. Chem. 44, 319-28(1920).—The sperm were obtained from ripe testicles of the common whitefish, *Coregonus albus*. The dried sperm heads, after alc.-ether extn., consist of about 70% nucleic acid and 30% protamine, coregonine. They contain 6% of P, all of which is combined as nucleic acid. No Fe is present. "The protamine is in loose combination with nucleic acid, and the nucleus is of the 'dissociated' (Kossel) type. The union is probably of the amide, rather than the ammonia, type. The figures obtained on analysis leave little doubt that the head of the sperm is essentially a chem. compd. consisting of the union of nucleic acid and protamine in the proportion of 4 mols. to 1."

A. P. LOTHEROP

Biochemical studies on marine organisms. II. The occurrence of zinc. MEYER BODANSKY. Univ. Texas. J. Biol. Chem. 44, 399-407(1920).—The amt. of Zn has been quant. detd. in 20 species of marine animals including the jellyfish, Portuguese man-of-war, oyster, clam, shrimp, crab, torpedo ray, sting ray, and 12 varieties of the higher fishes. The constancy of its occurrence indicates that it is a normal constituent of the tissues of these forms. The largest amts. were found in the oyster; min. 188.5, max. 341, av. 260 mg. per kg. of fresh substance. In the oyster the Zn is distributed rather uniformly in the digestive organ, mantle, and gills; the muscle contains less than the other tissues. When finely ground oysters are dialyzed for 96 hrs., 49.5% of the Zn was recovered from the dialyzate. The Zn may be present in excess of the amt. which can combine with the proteins of the tissue or part of it may exist in a loosely combined state which is split off during dialysis.

A. P. LOTHEROP

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## -12—FOODS

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W. H. BIOELOW AND A. E. STEVENSON

Adulteration of foodstuffs during the war. F. SCHOofs. J. pharm. Belg. 3, 53-56(1921).—S. gives data relative to the compn. and adulteration of foodstuffs marketed in Liège during the war. Milk was the product most frequently adulterated. "Olivette," a substitute for salad dressing, was found to be a vegetable mucilage (probably prepared from Irish moss) containing H<sub>2</sub>SO<sub>4</sub> and colored yellow with an unidentified coloring material of vegetable origin. A similar prepn. sold under the name of "olivina," consisted of 89.93% water, 5.2% AcOH, 4.0% NaCl and 0.8% gelatin. An adulterated product purported to be an edible oil consisted entirely of Na silicate colored slightly yellow. Flour was frequently adulterated. Especially was this true of the various pancake flours. Adulteration in this case generally took the form of the addition of flours prepared from rye, barley, corn, beans and other legumes. Often the mixt. contained the myceliums of molds, smuts, and the spores of rusts. Chalk was occasionally added to increase the wt. and 1 sample was found to contain 41% of plaster. A mixt. of NaHCO<sub>3</sub> and tartaric acid was frequently marketed under the name of "poudre fermentative" or an analogous title. A prepn. called "farine fermentante" consisted of a coarsely milled flour containing a small amt. of an alk. carb. A coarse powder consisting of 7.11% of CaCO<sub>3</sub> and 92.8% of NaCl was sold as "yeast." A sample of cacao contained 31.06% of shells and only 4.68% of fat. As adulterants of coffee are mentioned roasted cereals, beet seeds, chicory, the leaves of certain plants, etc. A prepn. marketed as

"concentrated bouillon" contained 87.66% of mineral matter, albuminous matter, 5.09% of fat and 8% non-nitrogenous matter and cellulose. A. G. DUMÉZ.

Standard methods for the sanitary analysis of milk. Third Edition. W. H. FARR, *et al.* Separate, Am. Public Health Assoc. (Boston) 1920, 24 pp.—The first edition was issued in 1910 and a second edition in 1916. A summary of the more important changes from the second edition follows: (1) The scope of the report has been broadened to cover the sediment test and the examn. of milk for the presence of long-chain streptococci. (2) A summary of required procedures is given at the end of the report. (3) Encouragement is given for further investigation of promising new lab. methods. (4) Official recognition is given to microscopic counts made directly from unpasteurized milk. (5) Methods for detg. the H-ion concn. of agar media are given. (6) It is recommended that the practice of speaking of agar plate counts as showing the "number of bacteria per cc." be discontinued and the words "number of colonies" used. (7) It is insisted that punitive actions should be based upon the av. results from a series of samples, and that, where possible, the routine counts should be verified by suitable procedures when actions based on their use are likely to be questioned. E. J. C.

Pasteurization of milk. Report of Committee on Milk Supply of the Sanitary Engineering Section, American Public Health Association. H. A. WHITTAKER, *et al.* Separate, Am. Public Health Assoc. 1920, 32 pp.—This report contains up-to-date information. The status of milk pasteurization in the U. S. and Canada is considered. The official definitions of pasteurization are given. The effect of pasteurization on the compn. of milk is covered by a review of the results of expts. on the effect of heat on milk and expts. on infant feeding. The mechanical features are discussed. The phase of the report covering the analytical control of pasteurization plants includes a discussion of the physical, chem. or physico-chem. and biological methods and procedure used to det. the effectiveness of the pasteurization process. The last section of the report deals with state and municipal supervision of the pasteurization of milk, containing a discussion of the time and temp. requirements, the department of a state or municipality to control pasteurization, requirements regarding app., qualifications of plant operators, bacterial results, and penalties for violations of regulations.

E. J. C.

Mustard oil as a preservative for milk. P. Post. Helder. *Pharm. Weekblad* 58, 131-8(1921).—The use of mustard oil (20 drops per l.) is recommended for preserving samples of milk taken for analysis. The acid no. of milk thus treated remains practically const. for about 4 days in winter and not less than 6 hrs. in summer. The oil does not affect the detn. of sp. gr., fat content, acid no., dry residue, sp. gr. and refractive index of the serum, rotatory power, ash, and Cl content; nor the nitrate test, the alc. test and the tests for preservatives. The f. p. detn. must be preceded by extn. with 10% sesame oil; the serum must be extd. 3 times with petroleum ether for the lactose detn.; the mustard oil must be removed by evapn. before detg. albumin. Catalase is destroyed by the oil and so cannot be detd. in milk so preserved. JULIAN F. SMITH.

The identification from the chemo-legal view-point of a flour which has been subjected to the effects of baking. ALEX. IONESCU. *Bull. soc. chim. Romania* 2, 9-11(1919).—Wheat flour contains 4 elements which might be considered in identifying the bread made from it, *viz.*, proteins, carbohydrates, mineral matter and cellulose. The proteins and carbohydrates are so greatly altered in baking they are of little value in connecting a particular sample of bread with a specific flour. The amt. of mineral salts is so small and may be so greatly affected by the water and NaCl added to the dough that they cannot be considered in legal evidence. Cellulose, however, is so characteristic of the quality of a flour and so slightly altered in baking that its detn. and microscopic appearance may be used as abs. proof of the identity of a flour and a sample of bread.

H. S. BAILEY.

The acid character of flour. JOH. PINNOW. Bremen. *Z. Nahr. Genussm.* 40, 243-6(1920).—Twenty g. of sugar, 50 cc. of water and 2 cc. of  $N Na_2CO_3$  were steam-distd. into 0.1 N Ba(OH)<sub>2</sub>. 72.2% of the total  $CO_2$  present passed over in 40 min. Without sugar, other conditions being the same, 20.8% of the  $CO_2$  passed over. A somewhat parallel expt. was carried on with rye flour with similar results.

D. B. DILL

Examination of baking powder. L. WOLFRUM AND JOH. PINNOW. Bremen. *Z. Nahr. Genussm.* 40, 247-59(1920).—Actual baking expts. indicated that flour and sugar liberate the combined  $CO_2$  from  $NaHCO_3$  (see preceding abstract); no increase in the raising power by the addition of acid constituents could be established. Apparently these serve only to neutralize alkalinity. It was ascertained that  $NH_4Cl$  neither increases the raising power of  $NaHCO_3$  nor prevents the discoloring effect of the resulting alkali on the yellow egg pigment. The method of calcn. of excess bicarbonate previously proposed by the same authors (cf. *C. A.* 14, 1587) was found to be unreliable for the reason that the  $NaHCO_3$  used in mfg. baking powders is often deficient in  $CO_2$ . Duration of heating and degree of diln. greatly affect the detn. of non-available  $CO_2$ . Available  $CaHPO_4$  may be detd. by boiling in excess alkali and titrating back with acid. On evapn. of a  $Na_2HPO_4$  soln. which had been satd. with  $CO_2$  it was found that considerable  $CO_2$  was held by the  $Na_2HPO_4$ .

D. B. DILL

The leavening of bread and baked goods. J. GROSSFELD. *Chem.-Ztg.* 44, 889-90 (1920).—A discussion of the value of yeast and baking powders in raising dough. The taste of the baked product is not influenced as much by the yeast as by the decompn. products produced during the fermentation. The use of mineral and org. acids with  $NaHCO_3$  for leavening is considered. Phosphoric acid was found to act satisfactorily. Whey, buttermilk or other sour milk products with  $NaHCO_3$  and  $CaCO_3$  are recommended in baking.

H. A. LEPPER

Indian curry-powder. A. DIEDRICHS AND B. SCHMITTMANN. *Z. Nahr. Genussm.* 40, 361-4(1920).—A sample of curry-powder from Madras was found to consist of curcuma, trigonella, coriander, and paprika, also possibly ginger and mustard as well as small unground leaves, probably *Murraya Koenigii* Spreng. The chem. analysis gave the following results: Loss in wt. at  $100^\circ$ , 12.99%; nitrogenous substances, 13.46%; ether ext., 13.13%; N-free ext., 32.33%; crude fiber, 10.88%; mineral components, 17.22%.

L. D. ELLIOTT

Report on edible fats and oils. R. H. KERR. Bur. of Animal Ind. *J. Assoc. Official Agr. Chem.* 4, 195-201(1920).—Collaborative results warranted the recommendation of the tentative adoption of a method for the detection of adulteration of lard with fats containing tristearin. The method is based on the difference in m. p. of the crystd. glycerides (*C. A.* 2, 2461) and of the fatty acids (*C. A.* 14, 3284). The figure 71 for the sum  $A + 2(A - B)$ , where  $A$  = m. p. of the glycerides and  $B$  that of the fatty acids, is too low; 73 has been adopted.

H. A. LEPPER

The estimation of theobromine in cocoa and its products. RAYMOND V. WATSWORTH. *Analyst* 46, 32-7(1921).—Criticism of previously suggested methods for theobromine in cocoa products is given and a new method suggested. Ext. samples high in fat, which are difficult to wet with  $H_2O$ , first with petroleum-ether (b. below  $80^\circ$ ). Triturate a 10-g. sample in a small porcelain dish with 3-4 g. freshly calcined  $MgO$  and 14 cc.  $H_2O$ . Partially dry on the  $H_2O$  bath for  $1\frac{1}{2}$  hr. with mixing at intervals to prevent any part from becoming perfectly dry. Transfer to a 250-cc. flask; add 150 cc. tetrachloroethane, boil under a reflux air condenser for  $1\frac{1}{2}$  hr. Filter while almost boiling to a 2nd flask. Boil the residue returned to the first flask 20-30 min. with 120 cc.  $C_2H_5Cl_4$ . Filter into the 2nd flask and wash 2 more times. Distil the united washings to 3-5 cc. Cool, add 60-70 cc.  $Et_2O$  (methylated, sp. gr. 0.720), mix and let

stand overnight. Collect the ppt. on a tared filter paper, wash with  $H_2O$ , dry at  $100^\circ$  and weigh. Add 0.004 g. for theobromine dissolved in 70 cc. of  $H_2O$ . Purity of the alkaloid was 99.9% calcd. from N detd. by the absolute method and 99.5% by the Ag method. Details and precautions of the method are discussed. The Kjeldahl method for N cannot be used on theobromine, because the heating volatilizes the N in amts. differing according to the rate. Total N, by this method on cocoa products is, therefore, in error.

H. A. LEPPER

**Experiments with the drying of vine fruits (Mildura Research Comm.).** A. V. LYON. *Science and Industry* (Australia) 2, 625-9(1920).—The d. of the grape juice was obtained by a pycnometer, and the corresponding degree Baumé calcd. from the formula given in Bur. of Standards, *Circ.* 19, degree Bé. =  $145 - (145/d_{20}^{20})$ . The result thus calcd. was taken as a measure of the degree of ripeness. Fruit picked when not sufficiently ripened will give a low poundage of dried fruit. With Sultanais raisins  $13^\circ$  Bé., and with Zante currants  $14^\circ$  Bé. represent the minimum stage of ripeness at which they can be profitably harvested. Before drying the fruit is dipped in boiling caustic soda soln. (which for Sultanais may vary from about 1 part in 60 to 1 part in 30, depending on ripeness), so as to yield fine almost imperceptible cracks which facilitate drying. If over-cracked, an exposure of sugar results. JEROME ALEXANDER

**Curua palm oil (ANON.) 27. Rhinanthocyanin (NESTLER) 11D.** Recovering the useful constituents of sweet calamus root (Ger. pat. 307,623) 17.

**Cooling and homogenizing sweetened condensed milk.** R. RAFF. U. S. 1,368,291, Feb. 15. Sweetened condensed milk is passed over a cooling surface while simultaneously subjected to the action of a roller to maintain its homogeneity.

**Preparation similar to meat extract, from bone extract.** J. SCHECKENBACH. Ger., 321,144, May 5, 1918. Equal parts of bone-meal ext. and waste liquors from the distn. of molasses thickened to a sirupy consistence, are heated to a temp. of  $105-150^\circ$  with stirring, in such manner that an evapn. of the  $H_2O$  contained in the mass is effected. The heating is continued until the mass is semi-solid and a reaction sets in which is indicated by the evolution of white vapors. At the same time a strong aroma of meat results. The mass is now allowed to cool, any acid or alk. reaction is neutralized, the mass is dissolved in  $H_2O$  and the resulting soln. is again evapd. *in vacuo*.

**Coffee substitute.** M. SIMON. Ger. 326,955, Dec. 23, 1917. Roasted coffee or its substitute is mixed with a rich caramel soln. and extd. for a long period at a moderate temp. with frequent shaking. The extractive stable coffee substitute is obtained directly by expression.

**Coffee substitute or adulterant.** K. MOHS. Ger. 326,671, June 1, 1917. Addition to 315,396. Instead of employing disintegrated potato peelings or pulp, as specified in the principal patent, brewers' grains, disintegrated by means of  $CaO$  under pressure, are roasted.

**Albumins.** M. MONHAUPT. Brit. 154,627, July 20, 1917. Colloidal solns. are obtained by mixing casein, vegetable albumins, or gluten, with not more than 1.5% by wt. of  $MgO$  or the corresponding amt. of basic or normal  $MgCO_3$  and  $H_2O$ . The resulting solns. are neutral to the taste and may be used as substitutes for milk, cream, white of egg, emulsifying fats in the manuf. of milk substitutes, as an emulsifying agent in the manuf. of margarine, etc. The solns. may be treated with  $CO_2$  without pptn. of the albumin, or  $CO_2$  may be injected into the mixt. of casein, etc., with  $MgO$  or a  $Mg$  carbonate and  $H_2O$  to give a soln. The solns. may be evapd. to dryness or pptd. by alc. to give dry water-sol. products.



### 13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

Theory and practice in chemical industry, with special reference to physical chemistry. E. B. R. PRIDEAUX. *J. Soc. Chem. Ind.* 40, 40-2R (1921).

Industrial research a vital factor in substantial growth. B. M. RASTALL. *J. Elec. Western Ind.* 46, 193-4 (1921).

An industrial research association (British Cotton Industry Assoc.). Author W. CROSSLEY. *Chem. Age* (London) 4, 73-4 (1921).—A plea for scientific method and research in industry, with a description of the Shirley Inst. at Didsbury, Manchester, established by the Brit. Cotton Ind. Assoc.

Report of the administrative chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada. A. B. MACALLUM. Ottawa (1920). Among the topics discussed are: The conservation of the supply of helium in Canada (the natural gas at Bow Island contains 0.3% of He and 12 million cu. ft. of this rare element are wasted annually); problems (mainly nutritional) affecting the fox-breeding industry; manuf. and use of nitrogenous fertilisers; industrial cooperation for research. Appendix D.—Utilization of Wood Waste in British Columbia. Here are discussed at length distn., manuf. of wood molasses (for cattle feed), of ethyl alcohol, and of wood-pulp. The production of charcoal especially for domestic fuel is regarded as the best immediate means for utilization of the wood waste. Appendix E.—Lignite Utilization. The committee, after a wide variety of pitches, flour, clay, water glass, cement and straw, conclude (1) good briquets can be made; (2) more binder than heretofore reported must be used, not less than 11%; coal-tar pitch at present seems cheapest; about twice as much binder is needed for carbonized lignite as for anthracite fines.

JEROME ALEXANDER

Obtaining maximum protection for an invention, the theoretical problem. HAROLD E. PORTS. *Chem. Age* (London) 4, 246-7 (1921).

The automatic control of the separation of a liquid into fractions limited by specified densities. HORACE BARRATT DUNNICLIFF. *J. Proc. Asiatic Soc. Bengal* 16, 150-61 (1920).—In running off waste liquors or washes from many industrial processes it is convenient to be able to sep. the liquid into two or more fractions detd. by limiting specific gravities, for subsequent storage and recovery of the valuable constituents. This may be accomplished automatically by use of the app. described; it consists of a series of bowls, each provided with an outlet in the bottom closed by a float, which settles tightly into a ground valve seat. This float may be constructed of any specified density, such that it will float and thus keep the outlet open until the sp. gr. of the liquor drops below the limit of the fraction to be sep'd. when it settles into its seat allowing the remainder of the liquid to overflow into the succeeding bowl, where another fraction may be sep'd. This process may be repeated as many times as necessary. The app. described has proved itself thoroughly practical in its application to the fractionation of the waste acids from the manuf. of gun cotton at Aravankadu, S. India.

J. T. R. ANDREWS

The isothermal concentration of a solution prepared from two salts yielding different ions. EYENNE RENGADE. *Compt. rend.* 172, 218-20 (1921).—An interesting theoretical discussion of the behavior of two salts capable of yielding different ions, on their concn. under const. temp. The progress of the concn. of the soln. and the order in which salts crystallize is illustrated graphically by a typical solution, that of  $\text{NH}_4\text{NO}_3$  and  $\text{NaCl}$ .

J. T. R. ANDREWS

Crystallizing plants. BRUNO WASSER. *Chem.-Ztg.* 45, 5-7 (1921).—By studying films showing crystal growth it was proved that a growing crystal absorbed a certain

and of the soln. in order to use it in building up its faces. In a soln. at rest, therefore, every crystal is surrounded by a layer of unsatd. soln., which must be removed if the crystal is to grow freely. The rate of cooling must correspond to the velocity of crystn. if regular crystals are to form. If the sp. gr. of crystal and mother liquor are alike complete crystals form; otherwise local concn. will cause formation of crystal conglomerates. To avoid this, regulated, uniform motion of the mother liquor is brought about. The addition of small amts. of albumin, etc., often favors crystn. Maintenance of correct humidity of air in crystg. rooms, seeding with crystals, devices for mechanical stirring and cooling are discussed, with special reference to the sugar and the potash industries, and the conclusion is drawn that an ideal crystg. plant is still a thing of the future.

W. C. EBAUGH

Automatic control of chemical reactions. PHILIP F. EDELMAN. *Chem. Age* (N. Y.) 29, 65-6(1921).—A general description of the advantages of the Edelman automatic elec. control of various chem. processes, without any details of the app. Thus in a sulfite paper mill the relative amt. of free and combined  $\text{SO}_2$  is continuously controlled to within 0.005%. The following applications are suggested: Control of (1) strength of solns.; (2) concn. of evaporator output; (3) suspended solids; (4) absorption of gas; (5) reactions of mixed liquids; (6) entrainment; (7) reaction of liquids with pulverized solids; (8) dilution of stock solns.; (9) neutralization; (10) water purification. Upon the appearance of contamination a condensate or drip for boiler feed can be automatically by-passed to the sewer.

JEROME ALEXANDER

Practical application of electro-endosmose and cataphoresis. W. R. ORMANDY. *Chem. Age* (London) 3, 475(1920).—Electro-endosmose is made use of technically in the purification of clays, removal of water from peat, prepn. of silica gels from Na-silicate, elec. tanning, concn. of ores, purification of gelatin for photographic purposes and for the sepn. of oil-water emulsions in the petroleum industry.

E. B. SPEAR

Ozone and "hyzone" and their technical applications. ANON. *Chem. Age* (London) 4, 240-1(1921).—"Hyzone" is triatomic H (cf. Wendt and Landauer, *C. A.* 14, 1779).

E. J. C.

Separation of alimes from liquids by centrifuging. BERTHOLD BLOCK. Charlottenburg. *Chem. App.* 8, 13-6, 23-4(1921); cf. *C. A.* 15, 779 cuts.—This is the 6th supplement to B.'s article (*C. A.* 14, 1872); in it he discusses power consumption.

J. H. MOORE

The economy of the so-called automatic return-feed apparatus in steam boiler plants. FRITZ BÜRK. Mannheim. *Chem. App.* 8, 21-3(1921); 1 cut.—B. calculates that pumps are from 23 to 74% cheaper to operate than the automatic system.

J. H. MOORE

Recent developments in grinding. CARL NASKE. *Z. Ver. deut. Ing.* 64, 469-75, 619-22, 980-5, 1109-13(1920).—A review of developments in crushing and grinding machines since 1910, with illustrations. Jaw-crushers, rolls, impact pulverizers, ball mills, tube mills; classifiers, sieves, conveyors, air-transportation systems; revolving furnaces, shaft furnaces; typical grinding layouts for aniline, superphosphate, carbide, ammonium salts, lime and portland-cement plants, are described.

W. C. EBAUGH

Form value of energy in relation to its production, transportation, and application. CHESTER G. GILBERT and JOSEPH E. FOGUE. *Mech. Eng.* 43, 26-8(1921).—The status of coal, oil and water-power are examd. in respect to their employment in the development of energy. Coordination rather than individualistic development should be recognized. The need is for adjustments in energy form to the end that greater efficiency in utilization and transportation shall be obtained, and a full measure of resource value received.

J. L. WILEY

Conservation of heat in power and heating systems. EDW. R. WEIDLEIN. *Chem. Met. Eng.* 24, 295-300(1921).—A discussion of 85% magnesia insulation (85%  $\text{MgCO}_3$ ).

Mg(OH) $_2$ ·5 H $_2$ O + 15% asbestos), showing low depreciation rate under wetting and drying, and high-temp. conditions. Four charts show the most economical cover thickness on flat surfaces and on  $\frac{1}{4}$ -inch to 24-inch pipe at various temps. gradients and steam costs, also heat loss from bare pipe, and the coal, heat, and money saved by insulation, and flow-sheet.

JEROME ALEXANDER

The qualities of the young engineer. L. B. ATKINSON. *Electrician* 86, 277-8 (1921).—An address. C. G. F.

Determination of resistance of lubricating oils to emulsification. (Report of Sub-committee V.) T. G. DELBRIDGE, et al. *Proc. Am. Soc. Testing Materials* 20, I, 416-26 (1920).—Twenty cc. of the oil to be tested are placed in a 25 × 200-mm. test-tube graduated from 20 to 50 cc. The tube is placed in a 3-l. water thermostat maintained at 87° F. and dry steam is blown in through a delivery tube 2.5 mm. in inside diam., whose open end is beveled to an angle of 30°, the rate of steam admission being such as to maintain the emulsion temp. between 190 and 195° F. The condensed water should not exceed 20 cc. in 4 min., greater condensation indicating wet steam; usual time of steaming is 4.5 to 6.5 min., depending on quality of oil, altitude, etc. When total vol. in test-tube = 40 ± 3 cc., it is placed in a separating bath, which consists of a 3-l. jar with perforated cover filled with water kept at 200-3° F., but positively not above 203° F. The progress of sepn. is followed by a stop watch, by examining every 30 sec., until 20 cc. of oil have sepd. If 20 cc. have not sepd. in 20 min., read the vol. of sepd. oil then to the nearest  $\frac{1}{4}$  cc. The resistance to emulsification (R. E.) is then given by the formula,  $R. E. = \frac{\text{number cc. sepd. oil} \times 5}{\text{number of minutes}}$ . This formula is based upon

an arbitrary value of 100 given to an oil which under the above conditions seps. completely in one minute. The oils which emulsified, without exception, sepd. into 3 layers: top, clear or turbid oil; middle, lacy or creamy emulsion; bottom, clear or milky water. The top layer only is read.

JEROME ALEXANDER

Sulfur determination (in lubricants). Report of Sub-committee III. FLORUS R. BAXTER, et al. *Proc. Am. Soc. Testing Materials* 20, I, 407-14 (1920).—Wide discrepancies appeared in the detn. of S in samples of topped Mexican crude, vulcanized oil and heavy red oil, which were sent to the members of the committee for analysis. The bomb method and Conradson's and Water's methods seemed to give the best results. Eschka's method is regarded as only qualitative. The presence of native S or S in combination injurious to Cu is detected by immersing strips of polished Cu in corked tubes of oil; on standing overnight the Cu is discolored. Details of Rother's, Water's and the bomb method are given.

JEROME ALEXANDER

Lubricating oils at high temperatures. J. B. RATHBURN. *Petroleum Mag.* 10, No. 2, 97-8 (1920).—The forced-feed lubricating system of an automobile engine may be considered a rough sort of viscosimeter, since the pressure noted depends on the viscosity of the oil. With this idea in view, R. tested oils with Saybolt viscosities at 70° F., as follows: 167, 225, 350 and 625. A six-cylinder valve-in-head engine, with lynite pistons, rated at 44 horse power, was used. The engine was started cold and then the temp. brought up to approx. 160° F. before the automobile was moved. From cold up to 30 miles per hr. there is a change in pressure difference between the oils of high and low viscosity from 20 to 3.6. At 15 miles it is 5.5. R. concludes there is no object in using the recommended heavy oil, since it causes harder starting and apparently gives no better lubrication at moderate speeds.

R. R. MATTHEWS

PERLE, ROBERT: *Compressed Air Plant*. 4th Ed. revized and enlarged. New York: John Wiley & Sons. 508 pp. \$4.50 net.

SCHNEIDER, LUDWIG: *Die Abwärmeverwertung im Kraftmaschinenbetrieb. Mit besonderer Berücksichtigung der Zwischen- und Abdampfverwertung zu Heiz-*

zwecken. 3rd Ed. Berlin: Jul. Springer. 223 pp. M. 16, bound M. 20. For review see *Techn.-Zig.* 44, 1278(1920).

**Evaporation of dilute solutions.** R. TANAKA, K. UEDA, K. SHIGEMATSU and J. KAMAYO. Japan 38,042, March 25, 1920. Gases having a high temp., obtained by burning producer gas, etc., are directly blown into the dil. solns. in fine bubbles.

**Volatile solvent recovery.** E. BINDSCHEDLER. U. S. 1,368,601, Feb. 15. Solvent vapors such as are obtained in the manuf. of smokeless powder are brought into contact with phenols to effect absorption of the greater portion of the solvent and the gases and vapors from the phenolic absorption system are subsequently treated with an alk. soln., e. g., NaOH soln., and with concd.  $H_2SO_4$  to recover their phenolic and residual solvent content.

**Protecting metal reaction tubes.** J. F. HARTMAN and F. VON BICHOWSKY. U. S. 1,368,395, Feb. 15. Metal reaction tubes, such as tubes of mild steel used for  $NH_3$  synthesis, are protected from oxidation at high temps. by wire screen wound around them and carrying a refractory coating material, e. g., fire clay.

**Lining for rotary kilns or furnaces.** A. F. MEYERHOFFER. Can. 209,766, Mar. 22, 1921. The lining consists of an inner layer containing a high percentage of fused alumina and an outer heat-insulating layer.

**Plastic composition for clutch transmissions.** D. LAKE. U. S. 1,368,945, Feb. 15. A mixt. of graphite 2, glycerol 1 and a fibrous material such as asbestos 2 parts is used for power transmission in fluid clutches.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

**Selection of sources of water supply.** GEORGE MITCHELL. *Water & Water Eng.* 22, 382-6(1921).—M. advocates adoption of surface supplies when practical from an economic standpoint and warns against public sentiment in the selection of more or less polluted sources when followed by proper purification. Concrete is preferable to earth dams, and reinforced-concrete aqueducts are advised. The practice of water storage is not economical when water is filtered. Rapid sand filtration is ordinarily more advantageous than slow sand filtration. In most cases, prefilters should precede slow sand filters. Sterilization with "excess lime" is inadvisable except with very soft waters, and in most cases Cl is preferable. Waste of water is discouraged. G. C. BAKER

**Wells as a source of supply.** ANON. *Engineering* 111, 161-4(1921).—The article deals with the water situation of India and the far East. Formulas are given for the calca. of the flow of ground water towards a well and the amt. of water obtainable from a definite stratum. Protective measures are urged to prevent pollution of the supply.

G. C. BAKER

**Relation of water supplies to public health.** J. W. S. McCULLOUGH. *Can. Eng.* 40, 199-200(1921).—This is a general review of the water problem, from the standpoint of cholera, typhoid, dysentery, goitre and lead poisoning. The removal of pollution is essential.

LANGDON PEARSE

**Nitrogen in the rainwater at Ithaca, New York.** B. D. WILSON. *Soil Sci.* 11, 101-10(1921).—With an av. yearly rainfall of 29.31 in. between May 1, 1915, and May 1, 1920, the soil received annually 12.51 lbs. of N to the acre. Of this amt. 11.5 lbs. was in the form of  $NH_3$  and 1.01 lbs. in the form of  $NO_2$ . The rain falling during the spring and summer contained more N than that falling during the other two seasons. The  $NH_3$  decreased rather suddenly during August and continued low during September and October. The  $NH_3$  fluctuated from month to month and year to year, while the  $NO_2$  remained more nearly const.

W. J. ROWBINS

Substances dissolved in rain and snow. WM. A. MOORE AND GLEN BACCHUS. *Chem. News* 122, 51-2(1921).—Investigations were carried out during a period of three months, May 31 to Aug. 13, 1920. Av. data for summer months show 0.28 p. p. m. of free and albuminoid  $\text{NH}_3$ , 0.35 p. p. m. of nitrate, and 0.23 p. p. m. of  $\text{CO}_2$ . Increased amts. of N were not detected during thunder storms, but  $\text{CO}_2$  was sometimes found. Traces of phosphate were frequently found and when the wind blew from a manufacturing center sulfate and  $\text{CO}_2$  were often detected. Chloride was not detected. When one rain immediately follows another a great decrease in all constituents is noted.

G. C. BAKER

Bacteriological methods of water analysis used in the American Expeditionary Force. EDW. BARTOW AND ROBERT F. GREENFIELD. *Am. J. Public Health* 11, 65-6(1921).—In addition to the bacteriol. methods and standards adapted from Standard Methods of Water Analysis of the A. P. H. A., Medical War Manual No. 6, entitled Lab. Methods of the U. S. Army, and the Standards set by the U. S. Treasury Dept. for water to be used on Interstate Carriers, certain expedient measures were employed where the amt. of app. and materials was limited and when interpretations had to be given with the shortest possible delay. For quick results water may be reported at the end of 24 hrs. as unsafe without treatment: (1) If the sanitary conditions as described in the report of the collecting officer are unfavorable; (2) if the number of bacteria growing on agar at  $37^\circ$  exceeds 100 per cc.; (3) if more than one of five 10-cc. portions show gas in lactose broth and coli-like colonies appear on Endo's medium, and (4) if the chem. condition is unsatisfactory.

G. C. BAKER

Comparative bacterial tests on Missouri river. FULLER AND MCCLINTOCK. *Rept. to Kansas City Water Commissioner* (1920); *Eng. Contr.* 55, 223(1921).

LANDON PRARSH

Some atypical colon-aerogenes forms isolated from natural waters. MARGARET C. PERRY AND W. F. MONFORT. *J. Bact.* 6, (1921).—Strains isolated from natural waters are grouped by their lactose, uric acid, adonitol, and methyl red reactions in Difco peptone broth (0.5% and 0.75%). 35 strains specially studied are grouped to make evident that there is a conflict between the Voges-Proskaur and methyl red reactions in standard Witte peptone broth. The uric acid reaction corresponds best with characteristics of the aerogenes group in carbohydrates, etc. This reaction may prove useful in checking and correcting the assignment of strains to the low ratio type indicative of possible fecal contamination. The sugar reactions of members of the large group can be tested as well in 0.2% as in 1.0% sugars.

JOHN T. MYERS

Personnel and scope of work at water-works laboratories. FULLER AND MCCLINTOCK. *Rept. to Kansas City Water Commissioner* (1920); *Eng. Contr.* 55, 243 (1921).—Data are given on 11 labs., showing number of men and work done. L. P.

Critical studies of the detection of nitrous acid in tap water. H. BERGER. *Z. Nahr. Genussm.* 40, 225-43(1920).—The detn. of  $\text{N}_2\text{O}_3$  by KI or ZnI<sub>2</sub> starch soln. gave accurate results within the limits 0.1 to 0.4 mg./l. when special precautions were taken. Titration with thiosulfate and colorimetric detn. with  $\text{K}_4\text{Fe}(\text{CN})_6$  lacked sufficient sensitivity. Detn. by means of resorcinol or diphenylamine possessed no special merit except that small amts. of water are required. Indole proved a most suitable nitrite reagent on account of the sharpness of the color changes, the passivity of the reagent towards other substances and the simplicity of the procedure. B. found that the employment of sulfanilic acid with phenol,  $\alpha$ -naphthol or  $\alpha$ -naphthylamine gave good results over an extremely wide range—0.01 to 10 mg./l.  $\text{N}_2\text{O}_3$ . The sulfanilic acid-phenol method was preferred on account of its greater simplicity. This latter method and the indole method were considered most commendable. Other less familiar methods were not found to be especially meritorious.

D. B. DILL

Construction of waterworks on land subject to subsidence. F. C. COOK AND

**B. C. MOON.** *Water & Water Eng.* 22, 376-81 (1921).—Filter beds and storage reservoirs constructed with reinforced concrete have satisfactorily withstood great pressures developed by surface disturbances due to deep mining directly under these installations, while water mains of flexible steel tubes have resisted the high tensile and shearing stresses. The water mains were covered with two coats of tarred hessian cloth for external protection from the corrosive action of the marl. The value of underground packing is questionable when the workings are carried on continuously and with an even face.

G. C. BAKER

**Factory mutual double check valves as safeguard for water supplies.** H. A. BURNHAM. *Can. Sect., Am. Water Works Assoc.* 1921; *Can. Eng.* 40, 203-6 (1921).—This is a thorough description of a double check valve and piping arrangements on dual water systems in factories, etc., with regulations for use and statement of approval by various State Boards of Health in U. S. A.

LANGDON PEARSE

**Stream pollution and industrial water purification.** J. T. TRAVERS. *Chem. Age (N. Y.)* 28, 450 (1920).—Industrial wastes are deadly to fish life and the organisms on which fish feed, and pollution of streams makes the water unfit for bathing and often creates a nuisance and a menace to public health. The following industrial wastes are satisfactorily treated with marl clay when used with any of the well-known coagulation agents: (a) Organic pollution—strawboard works, canneries, leather works, slaughter houses, packing plants, creameries, cheese factories, tankage plants and domestic sewage; (b) acid pollution—residue from steel mills, copperas water from coal mines and all waste liquors from plants where acids are used. The process neutralizes the acid before it enters the stream.

G. C. BAKER

**Boiler feed water purification.** ANON. *Blast Furnace and Steel Plant* 9, 128-9 (1921).—A description of the new water-softening plant of the Am. Coke and Chem. Co. of Granite City, Ill. is given. The water is first supplied to the cooling and condensing equipment, where it attains a temp. of about 100° F. The equipment consists of two reaction-settling tanks (34 ft. × 25 ft. 4 in.) which are used alternately in the treatment of the water. The tanks are fitted with stirring devices, which are stopped when the tanks are filled, and after the ppts. have settled the softened water is passed through filter beds of crushed quartz. The hardness is reduced from 15 to 1½ grains per gal.

G. C. BAKER

**Notes on water softening for boilers.** F. A. FROST. *Gas J.* 153, 468-70 (1921).—The lime-soda process and app. therefore are described.

J. D. WILBY

**Determining salt concentration at which boilers start priming.** R. J. C. WOOD. *Elec. World* 77, 373-4 (1921).—Sea water was pumped into a boiler and mixed with the concd. fresh water already in it. Priming began at 300 gr. of salt per gal. (5.0 g. per l.) and a working concn. of 200 gr. per gal. (3.4 g. per l.) was adopted. Daily sampling of the water, and detn. of the NaCl content instructed the foreman as to how much and how often to blow down each individual boiler with const. conditions at the steam plants and the amt. of condensate per hr. known, its NaCl content as detd., and the number of boilers being fed, the extent of blow down necessary to maintain a const. boiler concn. was calcd.

W. H. BORNTON

**Results of lime-softening of water supplies.** FULLER AND MCCLINTOCK. *Rept. to Kansas City Water Commissioner* 1920; *Eng. Contr.* 55, 243 (1921).—A comparison is given of the results obtained at St. Louis, New Orleans and Grand Rapids. L. P.

**Water softening for the manufacture of rain-water ice.** A. S. BEHRMAN. *J. Ind. Eng. Chem.* 13, 235-7 (1921).—Air is bubbled through the water as it freezes. "Core water" is generally pumped out and replaced by fresh water. Objectionable bicarbonates of Ca and Mg and less harmful permanent hardness may be removed with lime. Iron, alumina, silica and org. matter may be largely removed by lime-soda. Bleaching powder helps remove org. matter. Zeolite softening is unsatisfactory, as it

increases the amt. of Na salts, which are especially objectionable and removable only by distn. Waters having a salt content of 30-40 grains per gal. exclusive of the temporary hardness are not satisfactory for ice manuf. even after softening. G. C. BAKER

Water purification at Kynoch's explosives factory. H. H. DODDS. *J. S. African Assoc. Anal. Chem.* 3, 6-12(1920).—D. describes the plant used for the chem. treatment and filtration of the water supply for the factory and the village of Umbogintwini, S. Africa. Coagulation with  $Al_2(SO_4)_3$  and CaO was used with filtration through quartz chippings.  $CuSO_4$  was found most effective in destroying algae. G. W. STRATTON

Iron removal from groundwater. K. YRTING. *Der Städtische Tiefbau* 10, 9-15, 17-24; *Wasser u. Abwasser* 14, 202-7.—Y. gives a complete list of all Fe-removal plants in Germany with a brief description of the design of each plant and of the results obtained. F. W. MOHLMAN

The calculation of detention periods. FERD. SCHULZ. *Technisches Gemeindebl.* 21, 197-9; *Wasser u. Abwasser* 14, 231-3.—S. claims that the efficiency of sedimentation basins depends upon area rather than upon detention periods. Exptl. detn. of the rate of settling of various percentages of suspended solids gives data from which the area required can be computed. F. W. MOHLMAN

Madras city waterworks. II. Details of construction. III. Maintenance of water works. JAMES WHILBY MADELEY. *Water & Water Eng.* 22, 367-72(1921); cf. C. A. 14, 583.—The difficulties encountered and a description of materials used in the construction are given. Red Hills Lake, which is the main source of supply, is policed to prevent pollution of the water. The value of the roughing filter has not yet been detd., but the slow sand filters work efficiently when passing water at a rate of 4 to 5 1/2 in. vertical per hr. The filters occasionally break down owing to the fracture of the filtering skin by crabs, frogs, and fish. On emptying a filter a black layer, largely  $FeS$ , is found at the bottom of the fine sand. Washing of the sand is now being accomplished at a moderate cost. Difficulties have been experienced with corrosion of the iron pipes, both inside and outside. External corrosion is dependent on the nature of the soil, but surrounding the pipes with gravel to drain away the water has given good results. Internal corrosion, largely hydroxide and sulfide of iron, results largely from the decompos. of a large amt. of vegetable matter from the unfiltered water in the mains, and bad odors result. This difficulty will probably cease when only filtered water is supplied. A decrease in the death rate since the opening of the new works in Dec. 1914 is noted. G. C. BAKER

Experiences in chlorination of Florida public water supplies. GEORGE W. SIMONS, JR. *Florida Eng. Soc.* 1921; *Eng. Contr.* 55, 240(1921).—The chlorination of 9 water supplies is described with doses of liquid  $Cl$  running from 0.4 to 5.0 lb. per mil. gal. The operating troubles were due to clogging from impurities in the  $Cl$ , corrosion, neglect, lack of spare parts and lack of proper temp. control. Care in operation is essential. LANGDON PEARSE

New filtration plant for Palm Beach, Florida. GEO. W. SIMONS, JR. *Eng. Contr.* 55, 235-6(1921).—This is a 3-mil. gal.-per-24-hr. plant, to remove color and tastes or odors due to algae. The coagulant is first added, then the water is sprayed by aerators, passing to 2 coagulation basins (each 500,000 gal.). There are 6 filter units each 12 X 15 ft. with Harrisburg strainers perforated with 1/16" holes every 9 in. The filtered-water reservoirs hold 225,000 gal. The plant cost \$125,000. LANGDON PEARSE

The sampling of trade wastes proportionate to their discharge. G. O. LIEBAU. *Gesund. Ing.* 43, 209-11(1920).—Measurements of discharge over sharp-crested weirs are made at intervals of 10 min. Samples are taken when readings are made and saved for a 24-hour composite, which should be from 15 to 25 liters. F. W. MOHLMAN

Sewage disposal in streams, with reference to the Bergedorf sewage-disposal works at Hamburg. KAMMANN AND KEIM. *Gesund. Ing.* 43, 229-38(1920).—Dün.

sedimentation and digestion of org. matter are the 3 main factors in stream purification. The Hofer process, in which raw sewage is diluted with 3 or 4 vols. of pure water, and passed through fish-ponds, is very successful at Strassburg. The sewage of 2000 to 3000 persons can be handled per acre by this process. At Bergedorf Imhoff tank and sprinkling filter effluents were mixed and passed through fish-ponds from 1913 to 1919, with good growth of carp. Lemna and luxuriant vegetable growths were detrimental to fish culture.

F. W. MOHLMAN

A filter for the removal of very fine suspended solids from liquids. A. NEUSS. *Z. Abfallverwertung und Ersatzstoffwesen* 1919, No. 18, 169; *Gesund. Ing.* 43, 238-9 (1920).—A lab. membrane filter improved by Bachmann is recommended for the filtration of bacteria and suspended solids from sewage.

F. W. MOHLMAN

The biological treatment of "oil-water." KAMMANN AND KEIM. *Gesund. Ing.* 43, 245-7 (1920).—Wastes from oil refineries on the south bank of the Elbe at Hamburg prevented satisfactory treatment of sewage in septic tanks and sprinkling filters. All expts. with biol. methods were failures until the emulsion was broken up and the oil removed by the patented electrolytic method of Halvor-Breda. A second possibility is the "hummin" method. A third has been tried, in which the waste is heated under 4 to 5 atm. pressure, with almost complete sepn. of oil and water. None of these methods has as yet been applied to the total wastes.

F. W. MOHLMAN

The recovery of phosphoric acid from city sewage. EDIT. *Gesund. Ing.* 43, 287 (1920).—The  $P_2O_5$  content of the sewage of 12 European cities varies from 3.0 to 27.6 g. per cu. meter. No practical method of recovering this is known.

F. W. MOHLMAN

The purification of dye-factory wastes. MARTIN STRELL. *Das Wasser; Gesund. Ing.* 43, 308 (1920).—Mechanical clarification or pptn. of dye-factory waste is useless. Treatment with humin or ground peat, followed if necessary by alum, gives good results.

F. W. MOHLMAN

Sewage testing. P. ROHLAND. *Z. Wasserversorgung und Abwasserkunde; Gesund. Ing.* 43, 320 (1920).—R.'s colorimetric method for detg. colloids in sewage is accurate enough for the control of his colloidal-clay process.

F. W. MOHLMAN

The effect of sulfite-cellulose wastes on the sewage of Königsberg. F. SCHUTZ. *Z. Hyg. Infektionskrankheiten* 87, 185-241; *Gesund. Ing.* 43, 344 (1920).—Sulfite-cellulose wastes mixed with Königsberg sewage in the ratio 1 to 13 increased the O consumed from 580 to 4550 mg. per liter, and caused an intolerable nuisance from odors. Dilm. with 3000 vols. of fresh water was required to obtain stability.

F. W. MOHLMAN

The destruction of fungi on sewage farms. A. KOLKOWITZ AND C. ZAHN. *Mitt. Landesanstalt Wasser-Hyg. Berlin-Dahlem*. 1919, 25; *Gesund. Ing.* 43, 348 (1920).—Fungi may be destroyed by raking, by  $CuSO_4$  and by Cl compds.

F. W. MOHLMAN

Sewage treatment experiments at Grand Rapids with special reference to Dorr sewage clarifier. M. P. ADAMS. *Ill. Soc. Eng.* 1921; *Mun. County Eng.* 60, 60-6 (1921); *Eng. Contr.* 55, 226-8 (1921).—Grand Rapids is sewered on the combined plan. The sewage handled at the testing station contained large amts. of pulpy paper-mill wastes and tarry oils. The station was first operated with the 32-ft. tank as a Dortmund tank with a 57° bottom slope. This tank removed 45% of the suspended matter, making a sludge of 93.5% moisture. The Dortmund tank was remodelled in 1920 to a Dorr clarifier with bottom slopes 1 1/4 in. per ft. This tank removed 24-50% of the suspended matter, the sludge running as low as 79.2% moisture. Both fresh and digested sludge dried readily on sand beds. \$33,000 has been spent to date on sewage expts.

LANGDON PHARSE

Cleveland's submerged sewage outfalls. G. B. GASCOIGNE AND W. L. HAVENS. *Cornell Civil Eng.* 1921; *Pub. Wks.* 50, 188-90 (1921).—This is a complete eng. description of the 63-in. riveted steel pipe, the 72-in. concrete pipe and the 84-in. concrete pipe outfalls, with methods of laying. Studies of the bottom of the lake indicate the for-



mation of a sludge carpet around the outlets. Some coarse floating matter is found. Surface discoloration is also noted. The effects are much less with multiple outlets than with a single outlet.

LANGDON FRANKS

**Sewage tanks.** G. EVERETT HILL. *Mun. County Eng.* 60, 53-4 (1921).—The desirability of single-stage tanks is discussed, particularly on small installations. The use of tanks with walls diverging to the outlet is urged with an outlet weir properly protected by scumboards. An inverted bend discharging against the rear wall makes a good inlet.

LANGDON FRANKS

**Septic tanks for rural homes.** H. B. ROX. Univ. Minn. Agr. Extn. Div., *Special Bull.* No. 50, 20 pp. (1920).—The two-chamber septic tank connected to a tile drain or air-absorption bed is the best sewage-disposal plant for rural homes. The general shape of the septic tank should be rectangular and the sludge chamber should be twice as long as it is wide, with a depth of about 30 in. and an air space of about 1 ft. above the scum. Light should be entirely excluded, but there should be a slight circulation of air across the top of the liquid. The sludge tank should be so baffled that the incoming sewage does not disturb the bacterial scum on the top of the liquid. Acids and excess grease should be excluded. The inlet and outlet of the sludge chamber in all tanks should be on the same level and the same is true of the dosing chamber not equipped with an automatic siphon. Septic tanks in continuous use as a rule work better than those used only intermittently. Diagrams and specifications for construction are given.

G. C. BAKER

**Welsh sanitary section—its work on active service.** D. LLEWELYN WILLIAMS. *J. State Med.* 27, 361-79 (1919).—Work of the Welsh Sanitary Section during the World War is outlined under the following heads: Work on active service, sanitation of towns and villages, water supply, provision of water in the trenches, chem. analysis, bacteriological analysis, sanitation "up the line," sanitation of the trenches, sanitation of the camps—latrines, urinals, incinerators, manure, protection of food, cooks and cook houses, disposal of waste water, disinfection and investigation of infectious diseases, treatment of verminous conditions, canteens and estaminets, organization of a sanitary section and instructional work. Results are summarized.

G. C. BAKER

**Purification of air containing noxious gases.** DESGREZ, GUILLERMARD AND SAVES. *Compt. rend.* 171, 1177-9 (1920).—The most practical method was by spraying (atomizing) solns. capable of neutralizing the toxic gases. Solns. should be concd. but not to a degree to cause crystn. during or shortly after the spraying. Expts. were conducted in a room of 20 cu. m., through the walls of which the poison gas and a No. 1 Vermorel spraying nozzle were introduced. With an atm. containing 1 to 2000 of Cl the liquid used was  $\text{Na}_2\text{S}_2\text{O}_3$  220 g.,  $\text{Na}_2\text{CO}_3$  175, and  $\text{H}_2\text{O}$  1000. This soln. crystallizes at  $6^\circ$ . A soln. of normal  $\text{Na}_2\text{S}_2\text{O}_3$  166 g.,  $\text{Na}_2\text{CO}_3$  68,  $\text{NaCl}$  87, and  $\text{H}_2\text{O}$  1000 acts more slowly but crystallizes at  $-6^\circ$ . For a mixt. of Cl and  $\text{COCl}_2$  these sprays are inefficient and  $\text{Na}_2\text{CO}_3$  12 g. with  $\text{H}_2\text{O}$  1000 should be used. A soln. of Br 40 cc., washing lye 400 cc.,  $\text{Na}_2\text{CO}_3$  750 g. and  $\text{H}_2\text{O}$  up to 12 l. is active against Cl,  $\text{COCl}_2$ , formates, methyl chloride and perchloride, acrolein and bromoacetone. Chloropicrin was best neutralized by a soln. of Na polysulfides containing Na liver of S, 240 g., soap lye 140 cc., and  $\text{H}_2\text{O}$  up to 1 l., forming a stock soln. which should be dild. to 10 l. at the time of spraying. This soln. neutralizes Cl,  $\text{COCl}_2$ , chloroformates, methyl chloride and perchloride, acrolein, bromoacetone,  $\text{CNCl}$ ,  $\text{C}_2\text{H}_5\text{I}$ ,  $\text{C}_2\text{H}_5\text{Br}$  and  $\text{C}_2\text{H}_5\text{Cl}$ .

L. W. ROGGS

**The use of hydrocyanic acid gas for fumigation.** W. GLEN LISTON. *Indian J. Med. Research* 7, 778-802 (1920).—A review of HCN fumigation of houses, railway carriages, ships, etc., with a description of a plant for generating HCN on a large scale.

H. V. ATKINSON

**Sanitation in flooded districts.** HARRY F. FERGUSON. *Ill. Health News* 1921; *Eng. Contr.* 55, 241-2 (1921).—Recommendations are made for emergency work on

water supply, human waste disposal, removing org. deposits, cleaning cellars, floors, etc., and personal cleanliness.

LANGDON PEARSE

VOLLER, F. J.: Das Abwasserfätschverfahren. Munich: Reinhard Demoll. 48 pp. For review see *Gesund. Ing.* 43, 312(1920).

HOFER-HEIMALT, HANS: Grundwasser und Quellen. Braunschweig: Friedrich Vieweg. 198 pp., 66 illus.

Softening water. G. L. BORROWMAN. Brit. 155,092, Nov. 5, 1919. See U. S. 1,348,977 (C. A. 14, 3116).

Preventing corrosion in boilers. L. RENGGER and W. FUHRMANN. Brit. 154,610, Nov. 30, 1920. To prevent the formation of scale in a boiler, condenser, or the like, the negative pole of an elec. generator is connected directly to the boiler, etc., and the positive pole is connected to an electrode immersed in the  $H_2O$  in the feed tank or supply pipe outside the boiler, etc.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

A new classification of soil moisture. GEORGE BOUYOUCOS. *Soil Sci.* 11, 33-47 (1921).—On the basis of f. p. detns. of soil of various types and water contents and detns. of the % of water which freezes in soils at different temps. as detd. by the use of the dilatometer the soil water is classified as gravitational, free or water which freezes for the first time at a supercooling of  $-1.5^\circ$ , capillary-adsorbed or water which freezes at the supercooling of  $-4^\circ$  and combined water which does not freeze even at  $-78^\circ$ . The capillary-adsorbed and combined water are called unfree. W. J. ROBBINS

The concentration of the soil solution around the soil particles. GEORGE J. BOUYOUCOS. *Soil Sci.* 11, 131-8(1921).—The facts that the freezing-point lowering of soils decreases in amt. on repeated freezing and thawing, that  $H_2O$  is liberated from soils as shown by the use of the dilatometer on repeated freezing and thawing and that as the moisture content decreases the freezing-point depression of soils becomes abnormally greater show that the concn. of solutes is less in the soln. around the soil particles than in the remainder of the soil soln. W. J. ROBBINS

A short test for easily soluble phosphate in soil. O. M. SHEDD. *Soil Sci.* 11, 111-22(1921).—A short test for P in soil was made by adding 10 g. of air-dried soil to 25 cc. of 0.2 N  $HNO_3$  and shaking every min. for 5 min. The soln. was filtered until clear into a  $1/4 \times 8$ -in. test tube and 1 or 2 cc. of 60%  $NH_4NO_3$  and 5 cc. of molybdate soln. (U. S. Dept. Agr. Bur. Chem. Bull. 107(1908)) were added. The contents of the test tube were heated to  $60^\circ$ , shaken and allowed to stand for 30 min. at room temp. A comparison of the relative amts. of ppt. obtained in the above test with the P obtained by digestion with 0.2 N  $HNO_3$  for 5 hrs. or the total P in many Kentucky soils indicates that they vary together. It is believed that an amt. of ppt. occupying a space from 0.5 to 0.75 cm. or more in diam. in the test tube indicates that the soil needs no P. W. J. ROBBINS

Soil studies in the conifer forests of northern Sweden. OLOF TAMM. *Meddelanden Från Statens Skogsförsöksanstalt* 17, No. 3, 49-300(1920).—Conditions operative in soil formation and particularly the influence of different forest types on the soil and the effect of the soil on the forest were investigated. The forests of northern Sweden are normally covered with raw (sour) humus, underlain by ash-colored and rust-colored soil. Such soil type is known as a "Podsol." Since rainfall is in excess of evapn., leaching is the primary cause of the ash-colored soil underlain by the rust-colored soil. These extensive studies show that a measurable chem. decompn. takes place wherever

finely divided feldspars are in contact with water. The whole soil mass bears the marks of a thorough weathering process, which liberates elements essential for vegetation. The clays are rich in such mineral substances as are needed by the forest trees and the weathering processes which have given the clays their characteristics have not to any harmful degree removed the components most valuable to vegetation. Leaching of Ca is of great importance to the forest conditions. This process causes a measurable deterioration of the forest soil. However, soils which topographically are so situated that they receive the Ca-laden water are improved. This is shown by the changed character of the forest type. The formation of the ash-colored soil (blekjord, bleicherde) is associated with a decompn. of most of the minerals. Ten to 20% of the original soil mass is leached away. Apatite is attacked most, next the Fe and Mg minerals. Plagioclase is affected less and orthoclase still less. Quartz seems insol. In the deeper layers the ash-colored soil is not thoroughly weathered. Several easily weathered minerals are quite unchanged. Silicate weathering consists of leaching and additive processes directly and indirectly caused by the humus cover. The formation of rust-colored subsoil (rostjord, orterde) is a process of colloidal pptn. by humus of silicic acid, Al and Fe, which have been transported in the soil as colloidal matter. That which is not pptd. is carried by the ground water to the rivers and the sea. There are 3 types of red hardpan (ortsten, ortstein) clay, Fe and humus hardpan. The first is formed by the down-flushing of clay from the upper layer to a fixed place where a stony formation results. The cementing materials in the other two are Fe and humus compds. Al and silicic acid also serve as cementing materials. The properties of these hardpans are due to the cementing materials. Those which have large amts. of humus are friable. The hardest are those rich in limonite. The av. structure of these red hardpans is like soft sandstone. As a rule these red hardpans are favorable to the forest because of their water-retaining properties, especially on dry sandy heaths where the hardpans have reached the fullest development. The investigation gives ground for optimism concerning the future of Swedish forestry. It has shown that the mineral portion of the soil nearly everywhere is rich in such minerals as are needed by the forest. The only serious deterioration observed in some places concerns the humus cover. This can be improved by suitable soil and forest management. The severe climate is a serious drawback in the most northern portion, but even there the forest production is fair if the humus cover is in good condition. The production in large portions of the conifer forests of northern Sweden can be increased by methods well known to good forest management.

C. O. SWANSON

**Chemical effect of salts on soils.** W. P. KELLEY AND A. B. CUMMINS. *Soil Sci.* 11, 139-59(1921).—Portions of a sandy loam and a clay loam were shaken with  $H_2O$  or with solns. of different salts. The filtrates secured by means of a Chamberland-Pasteur filter were analyzed and the salt contents of the solns. obtained with  $H_2O$  and with the various salts, compared. When the soil was treated with the Cl,  $SO_4$  or  $NO_3$  of a given base an exchange of bases took place and a chem. equiv. amt. of other bases was set free. The anion was not materially affected. The simple salts in the extent to which they produce these reactions stand in the following ascending order: Ca, Na,  $NH_4$ , K and Mg. The base most easily replaced is Ca but Mg and K are also replaced. Considerable amts. of  $PO_4$  are ppt. by the solid used. With alkaline solns. a material lowering of the OH-ion concn. occurs and greater amts. of the cation of the soln. are pptd. than with neutral solns. The reactions between neutral salts and soils are dependent upon concn. and obey the law of mass action. W. J. R.

**The progress of the fertilizer industry in 1913-1920.** G. WICHEAN. *Chem.-Ztg.* 45, 3-4, 57-8, 81-2, 110-1, 129-31(1921).—A review with references. E. H.

**Armour fertilizer works. II.** CHESTER H. JONES. *Chem. Met. Eng.* 24, 379-84(1921); cf. C. A. 15, 1190.—The plant and method of manuf. of acid phosphate by the Svenska den system are described. E. H.

inoculated sulfur as a plant-food solvent. J. G. LIPMAN, A. W. BLAIR, W. H. MARTIN AND C. S. BECKWITH. *Soil Sci.* 11, 87-92(1921).—Crop yields on field plots to which inoculated or uninoculated S alone or with greensand marl or with rock phosphate indicate that inoculated S and ground phosphate rock gave better returns than phosphate rock alone.

W. J. ROBBINS

Sulfur and sulfur composts in relation to plant nutrition. W. E. TOTTINGHAM AND E. B. HART. *Soil Sci.* 11, 49-73(1921).—The changes in acidity, dil.-HCl-sol.  $\text{SO}_4$ ,  $\text{H}_2\text{O}$ -sol. and citrate-sol.  $\text{P}_2\text{O}_5$ , bacterial nos. and effects on crop yield of composts of soil or manure with S or with S and rock phosphate were detd. Soil composts with S added developed much acidity in 32 weeks. Composts of Sand horse manure showed appreciable increase in acidity but no increase in citrate-sol.  $\text{P}_2\text{O}_5$  after 15 weeks. S in composts of manure decreased the loss of org. matter by fermentation, although increased bacterial counts were maintained. Citrate-sol.  $\text{P}_2\text{O}_5$  approx. doubled where S was added. On Plainfield sandy loam the yield of oats was as great where S compost was applied as where the treatment included rock phosphate. In green-house trials S increased the yield of clover and of the Cruciferae and S in field plots increased the yield of seed in barley. S appears to function as a fertilizer both by oxidation to the nutrient  $\text{SO}_2$  and by producing an acid condition favorable to the production of available  $\text{P}_2\text{O}_5$ . It remains to be proved whether the efficiency of S is any greater when it is composted with rock-phosphate and manure than when these materials are added simultaneously to the soil.

W. J. ROBBINS

The mechanism of the fertilizing action of sulfur. G. NICOLAS. *Compt. rend.* 172, 85-7(1921).—Pot expts. show that S in appropriate quantities (200 kg. for beans, 300 kg. for peas per ha.) favors the formation of starch and the photosynthetic action of which starch is a result. Its use merits more profound study.

ALBERT R. MERZ

Switzerland's nitrogen requirements and technical methods for the production of the deficient nitrogenous fertilizer. O. NYDEGGER. *Schweiz. Chem.-Ztg.* 1921, 61-7.—Agriculture's post-war requirements of N are approx. 1000 tons. This can be considered as essentially covered by the  $\text{NH}_3$  produced by gas-works whose pre-war production was approx. 790 tons N. The requirements for the chem. industry, explosives industry and  $\text{H}_2\text{SO}_4$  industry are more than met by the production of the existing works at Chippis and Bodio using the Birkeland and Eyde process. The Haber process is discussed in detail.

ALBERT R. MERZ

Guano from Latham Island near Zanzibar. ANON. *Bull. Imp. Inst.* 18, 189-91 (1920).—A sample of guano from Latham Island gave on analysis: 0.76% total N, 29.52% total  $\text{P}_2\text{O}_5$ , 19.10% available  $\text{P}_2\text{O}_5$ , 35.36% CaO, 0.33%  $\text{K}_2\text{O}$ , 1.88% org. matter, 15.24% moisture off at  $105^\circ$ . To make a complete fertilizer, the guano would require to be incorporated with materials containing more  $\text{K}_2\text{O}$  and N.

R. L. SIBLEY

A study of the behavior of carbon disulfide when injected into the soil and its value as a control for the root form of the woolly apple aphid. B. R. LEACH. *Soil Sci.* 10, 421-64(1920).—By using pieces of roots infested with woolly aphid and buried in the soil it was found that soil moisture limits the max. diffusion of  $\text{CS}_2$ . It was found that  $\text{CS}_2$  cannot be applied during the year when conditions are favorable without injuring the roots.

W. J. ROBBINS

A comparison of inoculated and uninoculated sulfur for the control of potato scab. WILLIAM H. MARTIN. *Soil Sci.* 11, 75-85(1921).—Uninoculated com. flour S and com. flour S inoculated with 1% of soil from a compost heap known to contain S-oxidizing organisms were added to soil just before potatoes were planted in scab-infested land. H-ion exponents of soil samples taken from plots treated with inoculated S were lower than of those from plots treated with uninoculated S. In most instances the increase in acidity was accompanied by a corresponding decrease in the number of unsalable scabby potatoes. Cf. C. A. 14, 3745.

W. J. ROBBINS

The preparation of calcium cyanamide (KAMEYAMA) 6. Phosphate rock in 1919 (STRONG) 18. Report of the administration chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada (fertilizer) (MACALLUM) 13. The fluence of iron in the forms of ferric phosphate and ferrous sulfate upon the growth of wheat in nutrient solution (JONES, SHIVE) 11D. Nitrogen in the rain water at Itasca, N. Y. (WILSON) 14. Forms of nitrogen in soy-bean nodules (STROWD) 11D. Destruction of fungi on sewage farms (KOLKOWITZ), ZAHN 14. Potash resources of Nebraska (HICKS) 8. Report on nitrogen (HASKINS, PHELPS) 7. Peat deposits in the United States and their classification (DACHNOWSKI) 21.

Fertilizers. SOC. D'ETUDES CHIMIQUES POUR L'INDUSTRIE. Brit. 154,562, Sept. 2, 1920. Addition to 151,597 (C. A. 15, 569). The process described in the principal patent is modified by the use of acid salts for effecting the conversion of cyanamide into urea. The acid salt may contain a fertilizing element, such as K. E. g.,  $\text{NaHSO}_4$  or  $\text{KHSO}_4$ , may be used, the soln. concd. *in vacuo*, and Ca or other insol. phosphate added, whereupon a compact mass is obtained. Instead of an insol. phosphate, there can be added any other salt, e. g., kainite, which has fertilizing value or which by taking up  $\text{H}_2\text{O}$  reduces the necessity for evapn. The mixt. of  $\text{CaCO}_3$  and C, which remains from the decompn. of  $\text{CaNCN}$  in aq. suspension by  $\text{CO}_2$ , may be used in the manuf. of portland cement.

Fertilizers. SOC. D'ETUDES CHIMIQUES POUR L'INDUSTRIE. Brit. 154,563, Sept. 2, 1920. Addition to 151,597. In the decompn. of  $\text{CaNCN}$  by acid, the dil. cyanamide soln. first obtained is employed several times successively in the treatment of more  $\text{CaNCN}$  and the concd. soln. of cyanamide thus obtained is allowed to stand, with or without addition of a little  $\text{NH}_3$ . The dicyanodiamide sepg. out is converted into  $\text{NH}_3$  salts by treatment with an acid such as  $\text{H}_2\text{SO}_4$ ,  $\text{H}_3\text{PO}_4$ , or  $\text{HNO}_3$ , or a mixt. of acid and an acid salt. The excess acid is employed for the prepn., within the mixt., of superphosphate or other combination having fertilizing value. The  $\text{CO}_2$  produced in the decompn. of the dicyanodiamide may be collected and employed in the production of the cyanamide soln.

Preparation for protecting plants. C. VECALI. Ger. 320,920, June 27, 1915. The product serves for treating plants affected by parasite. It is prepd. by acting upon stibnite or substances containing it, with  $\text{CaO}$  and  $\text{H}_2\text{O}$ . Natural or molten stibnite, preferably ground, is mixed with  $\text{CaO}$ , a sufficient amt. of  $\text{H}_2\text{O}$  is poured on this mixt. and the mass is allowed to stand. It is stirred after a time and may be ground further to obtain a suitable com. product. The finished product is stirred in  $\text{H}_2\text{O}$  and applied to or sprayed upon the plant.

Product for destroying insects and other animal and plant parasites. G. J. LAMMENS and P. J. FRYER. Ger. 321,317, Dec. 21, 1916. The product consists of an ext. of the seeds, the leaves and other parts of plants of the genus *Tephrosia* of the class of legumes and of the family of Papilionaceae, obtained by means of a solvent, and in certain circumstances other substances are mixed therewith for emulsifying or dilg. or as vehicles. The new product is harmless to man, large animals and plants. The extd. compds. are removed from the evaporator as a solid mass and can be ground at once to a powder with the necessary additions.

## 16—THE FERMENTATION INDUSTRIES

H. S. FAINE

Wine dregs and their copper content. F. WIRTHLE and KARL AMBERGER. Würzburg. Z. Nahr.-Genussm. 40, 365-6(1920).—Cu was present in 2 samples of wine dregs, one examd. in 1919 and the other in 1920, in about the same amts., 205 mg. per kg.

dry substance. When  $H_2O$  is detd. on the sample which has been mixed with sand the subsequent  $Et_2O$  extn. of the same sample gives low results. To obviate this the detn. of  $Et_2O$  ext. was made as follows: Five g. of the wet dregs ( $H_2O$ , 50%) were rubbed up with 25 g. sand and extd. with  $Et_2O$  for 12 hrs. After grinding again the residue was extd. for several hrs. longer. For purifying the crude ext. thus obtained petroleum ether b. under  $50^\circ$  was used.

L. D. ELLIOTT

The yeast industry in 1919. KARL SCHWEIZER. *Schweiz. Chem.-Ztg.* 1920, 565-71.—A review with references.

E. J. C.

Injurious effects of whiskey from sulfite liquors (EULER) (BODFORSS) 11H. Recovering the useful constituents of sweet calamus root (Ger. pat. 307,623) 17.

TWEEDY, ROBERT N.: Industrial alcohol. Dublin: The Coöperative Reference Library. 1s. net. For review see *Intern. Sugar J.* 22, 460(1920).

WATERMAN, H. I.: Voordrachten over de Bierbronwerij. Gorinchem: J. Noorduyt & Zoon. 54 pp.

Glycerol from sugar fermentation. W. CONNSTEIN. U. S. 1,368,023, Feb. 8. Sucrose, dextrose, levulose, invert sugar, maltose or molasses is fermented as completely as possible with yeast in the presence of neutral or acid reacting salts to produce glycerol in yields up to about 12.5% of the wt. of sugar used. A mixt. formed of sugar 1000, crystd.  $FeSO_4$  900,  $(NH_4)_2SO_4$  8, Na phosphate 7,  $K_2SO_4$  2,  $MgSO_4$  7, yeast 100 and  $H_2O$  10,000 parts may for this purpose be fermented for 5 days.  $FeSO_4$  is removed from the product by evapn., crystn. and use of lime, and the filtered liquid products are acidulated with  $H_2SO_4$ , evapd. to a brown sirup, and extd. with alc. to sep. the glycerol. Other mixts. which may be employed are: Sugar 1500, crystd.  $Al_2(SO_4)_3$  1200,  $(NH_4)_2SO_4$  10, Na phosphate 8,  $K_2SO_4$  4,  $MgSO_4$  10,  $H_2O$  15,000 and yeast 150 parts; or sugar 1000,  $NH_4Cl$  300,  $(NH_4)_2SO_4$  10, Na phosphate 7,  $K_2SO_4$  3,  $MgSO_4$  8,  $H_2O$  9000 and yeast 100 parts; or sugar 1000,  $CaCl_2$  400,  $(NH_4)_2SO_4$  8, Na phosphate 5,  $K_2SO_4$  2,  $H_2O$  10,000 and yeast 100 parts. The fermentation is allowed to proceed at a temp. of  $30-35^\circ$  and requires 4-6 days.

Yeast. VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,281, Dec. 15, 1920. The cultivation of yeast is commenced in a wort of such diln. that the alc. formed is assimilated as fast as it is produced, more concd. wort being then added in such proportions that the alc. continues to be assimilated in the same way.

Yeast. VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,282, Dec. 15, 1920. A culture medium for yeast consists of a soln. of raw or refined sugar to which are added mineral salts to a total of not less than 15% of the amt. of sugar present. A suitable compn. is described containing  $(NH_4)_2SO_4$ ,  $NH_4H_2PO_4$ ,  $K_2SO_4$ , gypsum, and  $MgSO_4$ . The concn. must not be greater than 2% on the saccharometer.

Yeast. VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,283, Dec. 15, 1920. To facilitate the sepn. of yeast from fermented worts, sufficient alkali is added to the wort to give it a slight alk. reaction. The yeast then settles rapidly and can be removed without the aid of centrifugal separators. The yeast, which has been sepd. from the wort, may be slightly acidified with mineral acid before pressing, to avoid infection.

Yeast. VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,284, Dec. 15, 1920. In processes for the production of yeast in which the nutrient material is consumed as fast as it is supplied, the yeast is withdrawn continuously. A high narrow vat is employed, and below the air supply arrangements is an adjustable opening leading to a centrifugal separator. When the vat is full the outlet is opened to such an extent that the liquid containing yeast is withdrawn as fast as the nutrient material is supplied.

Yeast. VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,284, Dec. 15, 1920.

In a process for producing yeast in which a wort of low concn. is used and nutrient material supplied at such a rate that alc. is assimilated as fast as it is produced, the nutrient material used is a soln. of sugar or molasses to which appropriate mineral salts are added, in a proportion up to half the amt. of sugar employed. Suitable liquids are a mixt. of sugar soln. with  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{K}_2\text{SO}_4$ , and  $\text{MgSO}_4$ , and molasses with  $(\text{NH}_4)_2\text{SO}_4$ , superphosphate and  $\text{MgSO}_4$ .  $\text{CaCO}_3$  or an alk. substance is added to neutralize the acid produced.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,286, Dec. 15, 1920.

In a process of yeast cultivation in which sugar soln. or molasses mixed with mineral salts is used as the nutrient material, alkalies, or other suitable substances such as  $\text{CaCO}_3$  or  $(\text{NH}_4)_2\text{CO}_3$ , are added to neutralize the acids produced. The amt. of neutralizing substance added should be sufficient to combine with the whole of the acid radical of the nutrient salts, allowance being made for any basic substance contained in molasses or the like which is used.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,287, Dec. 15, 1920.

In a culture-medium for yeast consisting of sugar soln. and mineral salts, the K that would usually be employed is replaced by Na. A suitable compn. is described containing  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_4\text{H}_2\text{PO}_4$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{MgSO}_4$ , and chalk.  $\text{Na}_2\text{HPO}_4$  and  $\text{Na}_2\text{CO}_3$  also may be used.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,288, Dec. 15, 1920.

In a process for the cultivation of yeast in which the cultivation is started in a dil. medium, a more concd. medium being afterwards added in such proportions that the alc. is assimilated as fast as it is produced, antiseptics such as  $\text{HCHO}$  or  $\text{HCOOH}$  are added to the concd. medium in such proportion that the concn. of the antiseptic in the liquid in contact with the yeast is always so low that the antiseptic is assimilated as fast as it is added.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,289, Dec. 15, 1920.

In the cultivation of yeast in a medium consisting of a soln. of sugar and mineral salts, use is made of the acid liberated to check the growth of objectionable ferments. For this purpose, the yeast is grown in a portion of the medium without neutralizing agents until the required amt. of acid is produced, and the remainder of the medium is then added. Chalk or other neutralizing agent is supplied as required to prevent further increase in acidity.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,291, Dec. 15, 1920.

In a process for yeast cultivation yeast is added to a vat full of wort in a proportion not less than the normal yield expected from that quantity of wort nor greater than the greatest amt. that can possibly grow in it. Wort is then drawn off continuously from the vat, freed from yeast, and returned to the vat either wholly or in part. Fresh wort is also added continuously.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,292, Dec. 15, 1920.

In a process for yeast cultivation in which the wort is continually supplied in such quantities that there is no accumulation of alc., it being consumed as fast as it is produced, alk. mineral salts are supplied so as to be consumed in the same way, the wort thus always remaining feebly alkaline. A wort is described containing molasses,  $\text{NH}_3$ , superphosphate and  $(\text{NH}_4)_2\text{SO}_4$ .  $\text{KOH}$  and K and  $\text{NH}_4$  carbonates also may be used.

**Yeast.** VEREIN DER SPIRITUS-FABRIKANTEN. Brit. 155,293, Dec. 15, 1920.

In cultivating yeast in a soln. containing sugar and mineral salts, the process is started with neutral salts, such as  $(\text{NH}_4)_2\text{SO}_4$ , which produce acid during the growth of the yeast, and continued with alkalies, such as  $\text{NH}_4\text{OH}$ , so that the soln. remains neutral.

**Yeast; alcohol.** AKTIESELSKABET DANSK GARRINGS INDUSTRI & S. SAK. Brit. 153,607, Aug. 11, 1919. In fermenting to produce yeast, especially by the aëration process, additions are made to the fermenting mixt. of wort or mash of higher concn.

that that in which the fermentation is commenced in order to maintain the concn. of the nutrient substances. The alc. in the fermented mixt. may be recovered, and its amt. may be varied by varying the temp., aëration, etc., so that more or less is assimilated by the yeast. The liquid to be fermented may be sown with an amt. of yeast up to 60% of the material used in making the mash. A mash prepd. in the usual manner from maize, barley or barley malt and malt-culms, is filtered and the residues are washed. The weak washing waters are sown with yeast, and during the fermentation additions are made at intervals of the stronger washing water and of the filtered wort, the liquid being aërated by passage of air which is reduced in amt. in the later stages of the fermentation. Additions of  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_3$  soln. or nutritive salts may be added at intervals. Cf. 3,196, 1904.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Biologics and the pharmacists relation thereto.** ELSIE G. STEWART. *Am. Druggist* 69, No. 3, 22-8(1921).—The production of diphtheria antitoxin and vaccine virus is described and the precautions to be observed by the pharmacist in handling these products, as well as other biologics, are stated.

A. G. DuMEZ

**Incompatible mixture containing hydrocyanic acid and iodine.** JOHN NOBLE. *Chemist Druggist* 94, 151(1921); *Pharm. J.* 106, 74(1921).—N. observed that a water-white soln. was obtained in the preparation of a cough mixt. consisting of 20 minims of dilute hydrocyanic acid, 15 minims of tinct. of iodine and 1 fl. oz. of  $\text{H}_2\text{O}$ . This is attributed to the following reaction:  $2\text{HCN} + \text{I} = 2\text{HI} + (\text{CN})_2$ . On standing a yellow color developed due to the oxidation of the HI with the liberation of I.

A. G. DuMEZ

**Note on bismuth oxycarbonate.** HENRY STOUT. *Chemist Druggist* 94, 151(1921); *Pharm. J.* 106, 73(1921).—The Brit. Pharmacopeia does not permit even a trace of Ca in basic carbonate of Bi, whereas the U. S. Pharmacopeia tolerates 0.3% of impurity, which may be Ca. S. has examined a large no. of samples and finds that Ca is always present in quantities up to 0.5%. It is therefore suggested that the next edition of the Brit. Pharmacopeia permit the presence of not more than 0.3% of Ca.

A. G. DuMEZ

**The production of American storax.** S. A. MAHOOD AND ELOISE GERRY. *Drug. Circ.* 55, 3(1921).—Results obtained in expts. to det. the yield and cost of production of American storax (sweet gum) are reported. Trees were tapped by making (1) perpendicular incisions, (2) horizontal incisions, (3) by girdling ("deadening"). The largest yield (72.8 g.) was obtained from horizontal taps. The cost of production was \$2.37 per lb. A microscopic examination of that part of the wood from which storax is obtained showed that the gum is produced in special structures formed after the tree is wounded. The yield is in proportion to the number and size of the ducts thus developed. Suggestions are made for increasing the yield by modifying the horizontal tapping method.

A. G. DuMEZ

**Proposed changes in U. S. P. and N. F. formulas suggested by retail pharmacists.** THOMAS A. EGAN. *Drug. Circ.* 55, 6(1921).—The following modified formulas for some of the official U. S. P. and N. F. preparations are proposed. *Infusion of digitalis*: Digitalis (bruised), 15 g.; cinnamon water, 150 cc.; distd. water, 500 cc.; carbonated water, a sufficient quantity to make 1000 cc. *Ichthylol varnish*:  $\text{H}_3\text{BO}_3$ , 31 g.; tragacanth, 15.5 g.; lime water, 480 cc.; camphor water, 240 cc.; rose water, a sufficient quantity to make 1000 cc.; alcohol, 3 cc.; ichthylol, any desired quantity. *Zinc ointment*:  $\text{ZnO}$ , 20 g.; oil of sesame, 15 g.; lanolin (anhydrous), 15 g.; benzoinated lard, a sufficient quantity to make 100 g. *Mercurial ointment*: Hg, 500 g.; oleate of mercury, 20 g.; prepared



suet, 230 g.; lanolin (anhydrous), 150 g.; benzoated lard, 100 g.; oil of lavender flowers, 8 cc. *Camphor water*: camphor, 8 g.; distd.  $H_2O$  to make 1000 cc. Dissolve the camphor, previously granulated, in recently boiled distd.  $H_2O$ , set aside in a refrigerator for 48 hrs., and filter.

A. G. DeMun.

**Benzyl succinate:** Preliminary report on its composition, manufacture, properties, and probable uses. M. BYE. *J. Ind. Eng. Chem.* 13, 217-8 (1921).—This substance, prepd. by heating the free acid with  $PhCH_2OH$ , forms colorless crystals, is practically odorless, and possesses only a slight benzyl taste. The % of the  $PhCH_2$  group is 61.08, as compared with 42.89% for that in  $BzOCH_2Ph$ . Investigations so far show that the compd. may be administered by mouth in powdered, tablet or capsule form without fear of nausea or other intestinal disturbances, being in fact practically non-toxic, and hence should prove preferable in all cases where  $BzOCH_2Ph$  might otherwise be indicated.

W. O. E.

**Atropine sulfate from *Datura stramonium*.** H. W. RHODEHAMEL AND E. H. STUART. *J. Ind. Eng. Chem.* 13, 218-20 (1921).—The alkaloid was extd. by grinding the entire green plant, percolating with acidulated  $H_2O$ , adsorbing the alkaloidal substance in fuller's earth or Lloyd's reagent, then treating the concd. product in aq. alk. suspension with an org. solvent. The crude alkaloidal material thus obtained was purified by extg. with 95% alc., acidulating with AcOH and concg. first to 12%, then under diminished pressure to 2% of its original vol., whereby all hyoscyamine is converted into atropine. After neutralization with  $NH_3$  and allowing the liquid to stand overnight, the atropine was obtained by extg. the filtered soln. with  $Et_2O$  and careful drying at 35°.

W. O. E.

**Investigation of the U. S. P. assay for phosphoric acid and soluble phosphates.** A. E. STEARN, H. V. FARR AND N. P. KNOWLTON. *J. Ind. Eng. Chem.* 13, 230-5 (1921).—The U. S. P. method for the assay of  $H_3PO_4$  is incapable of yielding true results except at one specific concn., namely 6.2 mg. per cc. The error varies from about +3% at a concn. of 0.62 mg. per cc. to -8% at a concn. of 11 mg. per cc. This is probably due to the formation of slightly sol. acid phosphates of Ag, the amt. formed increasing rapidly as the phosphate concn. increases and the excess of  $AgNO_3$  simultaneously decreases. The fair results obtained at the specific concn. given in the U. S. P. are probably due to the accidental compensation of a number of errors at that particular concn. By modifying the method to the extent of transforming the acid to the trisodium salts, results are obtained which coincide with the results yielded by the pyrophosphate method, and which are independent of the concn. of the phosphate.

W. O. E.

***o*-Cresol method for eucalyptol determination.** C. T. DENNETT AND M. S. SALAMON. *Perf. Essent. Oil Rec.* 12, 11-2 (1921); cf. *C. A.* 15, 146.—Referring to the authors' criticism of the Cocking method, some expts. on blended oils are reported which tend to modify their previous view of the problem, in that the Cocking process does indeed afford a rapid and easy procedure for approximately detg. eucalyptol in all grades of eucalyptus oil, providing that they contain 45% or more of eucalyptol. This process, moreover, offers the additional advantage that in inexperienced hands it is more likely to give consistent results than the  $H_3PO_4$  method, which requires considerable care and experience.

W. O. E.

**Manufacture of otto from Indian rose.** J. P. SRIVASTAVA AND D. N. SINHA. *Perf. Essent. Oil Rec.* 12, 14-5 (1921).—The authors' conclusions based on confirmatory expts. are: (1) The still devised by the Indian Essential Oils Co. (an improved direct-fired still with 20 gal. capacity and worm condenser) is the most suitable; (2) in order to get a proper yield of oil, the distillery must be protected from the hot winds and the place must be kept cool and humid by some contrivance such as the use of *klus* tattles,

(3) the quantities of flower and  $H_2O$  used should be 25 lbs. and 100 lbs., resp., and the distillate carried out for 3 hrs; (4) fresh flowers plucked before sunrise are the best.

W. O. R.

**Phenoliodine in pneumonia, septic infections and erysipelas.** J. A. HUSIK. *N. Y. Med. J.* 113, 98-101(1921).—The drug is prepd. from resublimed  $I_2$  and phenol. Each dose is composed of 4 g. phenol and 2 g. of  $I_2$  dild. with 5 cc. sterile normal salt soln. and incubated for 1 to 2 hrs. The  $IC_4H_3OH$  soln. is used. The  $1,4C_6H_3OH$  is discarded. Favorable results are reported from its use in pneumonia, etc.

F. S. HAMMETT

**Fracture of digitalis and the infusion in therapeutics.** SOMA WEISS AND ROBERT A. HARTMAN. *J. Am. Med. Assoc.* 76, 508-12(1921).—The U. S. P. and B. P. methods of prep. the infusion are discussed. The authors prefer the following procedure: One liter of boiling water is poured on 10 g. of digitalis leaf in No. 60 power, allowed to stand one hr. in a boiling water bath with frequent stirring, water is added to replace that lost by evapn. The infusion is cooled, filtered through paper, or filtered hot if desired in a sterile condition. In completely filled sealed bottles this infusion retained its full activity for more than 2 years. An infusion of the marc left from the prepn. of the tincture of digitalis was tested on cats and found to be practically inert. "There is no essential difference in the amts. of saponins present in the tincture and in the infusion prepd. from equal wts. of leaf, and therapeutic doses of digitalis do not contain enough to induce any undesired effects. The official infusion does not represent the drug completely; hence standardization of the leaf does not insure uniformity in activity of the infusion. The variability of the infusion is at the expense of the more absorbable active principles. The infusion prepd. by the authors' method represents the activities of the leaf completely; hence it permits uniformity when a standardized powder is used for making it. It may be used in place of the tincture in doses just 10 times the vol. of those of the latter." There appears no qualitative difference between tincture and infusion when the latter is properly prepd.

L. W. RIGGS

**Cultivation and manufacture of tobacco in Mauritius.** ANON. *Bull. Imp. Inst.* 18, 252-6(1920).—The green tobacco, after 12 to 15 days in the drying sheds, is moistened with  $H_2O$ , and the moist ribs are made up into twisted packets weighing about 2 lbs. and then packed into "carottes." These are tightly packed and are unwound and rewound at intervals and finally stored under considerable pressure. On storing for 1 to 2 yrs., a process of slow oxidation takes place, resulting in the destruction of the greater part of the nicotine and the production of organic acids and a tarry matter which colors the final product. The yield of cured tobacco amounts to about 16% of the green leaf.

R. L. SIBLEY

**The significance of adsorption in analytical chemistry.** V. Adsorption by filter paper of salts of alkalis, alkaline earths and alkaloids. I. M. KOLTHOFF. *Pharm. Weekblad* 58, 94-101(1921).—Filter paper does not remove from soln. either ion of  $NH_4Cl$  or of the sulfates, nitrates or iodides of the alkali metals. There is negative adsorption of  $Cl^-$  from  $NaCl$  solns., although no  $Cl$  could be detected in the paper. Apparent adsorption of  $K_2Cr_2O_7$  occurs in acid soln. (0.4 N) but not in neutral soln. The effect was found to be due, however, to slow oxidation of cellulose in acid soln. Morphine-HCl is not adsorbed. The fixation of quinine-HCl and strychnine-HCl follows the equation:  $x/m = ac^{1/n}$ , where  $x/m$  is amt. adsorbed (in mol. equivs.), and  $c$  is concn. For quinine-HCl  $\alpha = 0.078$ ,  $1/n = 0.34$ ; for strychnine- $HNO_3$ ,  $\alpha = 0.19$  and  $1/n = 0.4$ . Expts. with salts of brucine and cocaine gave no conclusive results. Paper which has been practically freed from ash by washing with HCl has little or no adsorbing power for salts of alkaloids.

JULIAN F. SMITH

**Collobiases and intraits.** M. TH. KOKS. *Pharm. Weekblad* 58, 179-86(1921).—A typical collobiase is prepd. by dissolving 0.9 g. of arabic acid in 15 cc. of  $Ca(OH)_2$

soln., adding 226 mg. of quinine-HCl, dilg. to 200 cc. and heating 15 min. on a boiling water bath. The cooled soln. is an intrait of quinine-HCl; by dialysis, removing the liberated  $\text{CaCl}_2$ , it yields a collobiase of quinine containing 1 mg. of alkaloid per cc. A general discussion of the prepn. and uses of collobiases and intrait is given.

JULIAN F. SMITH

Investigations on neocarsphenamine. V. VAN ITALLIE. *Pharm. Weekblad* 58, 186-92(1921).—A lecture.

JULIAN F. SMITH

Preparation of sterile iodoform emulsions. J. BLOMBERG. *Pharm. Weekblad* 58, 192-3(1921).—Cover 2 portions (60 and 40 g.) of  $\text{CHI}_3$  with 20 and 15 cc., resp., of  $\text{Et}_2\text{O-EtOH}$  (80:20), let stand in the dark 12 hrs., and evap. in a vacuum desiccator. Dissolve the 40-g. portion in 1 l. of sterile olive oil at  $55^\circ$  in a 1250-cc. bottle. Grind the 60-g. portion fine in a sterile mortar, add it to the soln. and shake thoroughly. No cryst.  $\text{CHI}_3$  will ppt. from this emulsion.

JULIAN F. SMITH

Acidum sulphuricum aromaticum, Brit. Pharm. HERBERT C. WALKER. *Pharm. J.* 106, 130-1(1921).—The B. P. does not refer to possible loss in acidity due to formation of  $\text{EtHSO}_4$  in this prepn. A B. P. sample, assaying 12.33%  $\text{H}_2\text{SO}_4$ , had lost after 1 week 0.19%; in 1 yr. 1.81%, i. e., 14.68% of the original amt. of  $\text{H}_2\text{SO}_4$ . Detn. with  $\text{BaCl}_2$  after 1 yr. gave 8.11%. A sample kept in the dark, deteriorated at about a 1% less rate. The U. S. P. assay method, directing 6 hrs. boiling with  $\text{H}_2\text{O}$ , showed only 10.8%  $\text{H}_2\text{SO}_4$  in the fresh sample; boiling for 12 hrs. gave 11.5%, i. e., still 6.7% too low; hence the assay is not practicable as a lab. test. The B. P. should adopt a suitable assay method, or allow for deterioration.

S. WALDBOTT

The bacterial flora of several medical substances (LANSBERG) 11C. The Otopia nutmeg (ANON.) 27. New laboratory devices (for filling and sterilizing ampoules; a suppository) (VAN DER WIELEN) 1. Relation between the chemical constitution and taste of perfumes. A new perfume with sweet taste (FURUKAWA) 11A. The development of chemotherapy (KARRER) 11H.

BAKER, RICHARD T. AND SMITH HENRY G.: A Research on the Eucalypts. Especially in Regard to their Essential Oils. Technical Education Series No. 24. The N. S. Wales Technol. Museum. 464 pp. For review see *Chem. Eng. Mining Rev.* (Australia) 13, 141(1921); *Perf. Essent. Oil Rec.* 12, 48-9(1921).

PIUBELLINI, GIUSEPPE: Dizionario comparato di terminologia farmaceutica. 2nd Ed. Rome: (30) Via delle Terme N. 92. Giuseppe Piubellini. For review see *Boll. chim. farm.* 59, 488(1920).

Recovering the useful constituents of the sweet calamus root. ANTON DIPPPE SOHNE. Ger. 307,623, Aug. 5, 1917. The root of the sweet calamus has been heretofore worked solely for ethereal oil. In order to utilize also the other constituents contained therein, especially the fatty oils, starch, sugar and proteins, the ground root is extd. with an org. solvent such as benzene or benzene. The solvent and ethereal oil are removed from this ext. by distn., the fatty oil remaining as a retort residue. The extn. residue can be used directly as a fodder, or it can be used for the manuf. of spirit by converting the starch into sugar, fermenting the mash and obtaining the spirit by distn. About 3% ethereal oil and 5% fatty oil are obtained.

### 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

Armour Fertilizer Works. I. CHESTER H. JONES. *Chem. Met. Eng.* 24, 333-7 (1921).—The plant and process of  $\text{H}_2\text{SO}_4$  manuf. by the chamber method are described.

E. H.

The domestic potash industry. ANON. *Chem. Age* (N. Y.) 29, 12-4(1921).

E. H.

A review of the advance in inorganic technology from 1916 to 1918. JAR. MUR-  
NAUER. *Chem. Listy* 14, 114-6, 127, 149-52, 181-3, 200-1(1920). JOHN M. KRNO.

The development of the chemical industry for the utilization of atmospheric  
nitrogen. K. RENELT. *Chem. Listy* 14, 61-4, 76-84, 89-92, 109-12(1920).—Historical.

JOHN M. KRNO

Constructive suggestions regarding Muscle Shoals. FRANK W. WASHBURN.  
*Chem. Age* (N. Y.) 29, 51-2(1921).—Built essentially to fill the war demand for  $\text{NH}_4\text{NO}_3$ ,  
used in bursting charges of shells and not as a propellant, the Govt. plant at Muscle  
Shoals, Tenn., cannot compete with by-product  $\text{NH}_3$  for agricultural and other peace-  
time uses. To maintain the plant for use in future emergencies and at the same time  
to avoid operation at a loss, the restricted operation of the plant is suggested. Full  
operation would mean over-production and large loss. JEROME ALEXANDER

Manufacture of synthetic ammonia at Oppau, Germany. I, II. ANON.  
*Technique moderne* 12, 449-60(1920); *Chem. Met. Eng.* 24, 305-8, 347-50(1921).—After  
Haber completed Le Chatelier's work by detg. the conditions for max. combination  
of N and H, it required 10 years' work to solve the problems of making large amts. of  
pure N and H, extg. the  $\text{NH}_3$  from the mixt., conversion of the ammonia into readily  
marketable products and the devising of suitable app. A mixt. is made of water gas  
and producer gas. Steam is added and the whole is passed over a catalyzer at 400-  
500°. CO and  $\text{H}_2\text{O}$  form  $\text{CO}_2$  and H. The  $\text{CO}_2$  is dissolved in water at 25 kg. and  
traces of  $\text{CO}$  and CO are removed by passing the gas through NaOH and ammoniacal  
copper formate solns. N from liquefied air brings the nitrogen vol. to one-third that  
of H. This mixt. is then heated to about 500°, compressed at 200 kg. and subjected  
to the action of a second catalyzer. The  $\text{NH}_3$  produced is absorbed by water. The  
residual gases with fresh additions are passed again through the catalyzer. The  $\text{NH}_3$   
may be oxidized to  $\text{HNO}_3$ , converted into  $\text{NH}_4\text{NO}_3$ ,  $\text{NH}_4\text{Cl}$ ,  $(\text{NH}_4)_2\text{SO}_4$ , etc. Mixed  
ammonia and potash salts are made up into special fertilizers. The gas producers  
and water-gas generators are described with operating data. The producer and water  
gases pass separately through turbine-type washers and through cyclones to complete  
their purification. They are then metered and mixed in the ratio of two parts of water  
gas to one of producer gas. *Catalytic oxidation of Co.* The gas mixt. receives 76 g.  
of steam per cu. m. as exhaust from the turbo-ventilators, and is satd. with moisture by  
passing through jets of water at 95° on its way to the catalyzing chambers. The cata-  
lyst, a mixt. of  $\text{FeO}$  and  $\text{Cr}_2\text{O}_3$ , is kept at 500°. The gas mixture after treatment con-  
tains about 30%  $\text{CO}_2$  and 1.5% CO. The gases are compressed in five stages. When  
at 27 kg. they are treated in absorption towers with water under pressure. The  $\text{CO}_2$   
is reduced to less than 1%. CO is removed by treating the gases with ammoniacal  
cuprous formate soln. under 200 kg. pressure in towers of forged steel tubes. The re-  
maining  $\text{CO}$  is next removed by treatment with NaOH soln. at the same pressure.  
About 8 cu. m. is consumed hourly. II. *Catalysis of the N and H Mixture.* Increase  
in pressure aids the union of N and H, whereas increase in temp. lowers the yield of  
 $\text{NH}_3$  but increases the rate of reaction. The theoretical maximum yield of  $\text{NH}_3$  at 600°  
under a pressure of 200 atm. is from 8 to 9%. The gases are circulated continuously  
and the  $\text{NH}_3$  is absorbed by water as fast as formed. H diffuses through steel at temps.  
above 450°, combines with carbon, forming methane, and leaves cavities in  
the metal. The catalyzer is designed so that H diffusing from the inner tube  
meets N in an outer tube. The inner tube is 12 m. high, 1.10 m. external diam.,  
and 12 cm. thick in wall. It and the outer tube are of steel. The gases on  
leaving the catalyzers are cooled to ordinary temp. and treated with water at 200 atm.  
pressure. At the start the catalyzers are heated to 500° by means of a mixture of air

and hydrogen injected at 200 atm. and ignited by a hot Pt wire. The heat of reaction then maintains the required temp. A 25% soln. of  $\text{NH}_4\text{OH}$  is produced, and the gas is removed by treatment with steam and stored in a gas holder over water covered with oil. *Ammonia Oxidation.* The catalyzer used is thought to be a mixt. of oxides of iron, manganese and chromium agglomerated with  $\text{BiCl}_3$ . It is prepd. in granules 5 to 8 mm. in diam. and forms layers about 5 cm. deep on perforated shelves.  $\text{NH}_3$  and air are mixed and passed over the contact mass in the ratio of 36.8 cu. m. of the former to 46.6 of the latter. Gas furnaces supply heat to the oxidation furnaces. The oxidized gases supply heat to eight waste-heat boilers. Each of sixteen furnaces oxidizes about four tons of  $\text{NH}_3$  daily with 80% efficiency. *Absorption of Nitrogen Vapors.* If absorbed by water in towers, the vapors yield 50% nitric acid. If they are passed into  $\text{Na}_2\text{CO}_3$  soln. a mixt. of nitrate and nitrite is obtained. J. O. HANDY.

The production of potassium perchlorate. E. BLAU AND R. WEINGAND. *Karlsruhe. Z. Elektrochem.* 27, 1-10(1921).—The production of  $\text{KClO}_4$  by both the thermal and the electrolytic methods has been studied. Satisfactory yields of this substance have been obtained by heating c. p.  $\text{KClO}_3$  in glass vessels at  $510^\circ$  for 1 hr. In the presence of small quantities of  $\text{KOH}$ ,  $\text{Cu}$ ,  $\text{Ni}$ , superficially oxidized  $\text{Fe}$ , and  $\text{B}_2\text{O}_3$ , the  $\text{KClO}_3$  commences to decompose even while much  $\text{KClO}_3$  is present. Technical chlorate behaves in a similar manner. The best results have been obtained in quartz vessels without the use of catalysts, 69 g.  $\text{KClO}_4$  being formed from 100 g. techn.  $\text{KClO}_3$  in 8 hrs. at  $480^\circ$ . Attempts to suppress completely the  $\text{KClO}_3$  in the raw end-product have not been successful, on account of the fact that a marked decompn. of the  $\text{KClO}_3$  sets in while 3-4%  $\text{KClO}_3$  is still present in the reaction product. It is pointed out that Fe vessels cannot be employed for the  $\text{KClO}_3$  melt. Good current yields (70-93%) of  $\text{KClO}_4$  have been obtained by electrolyzing solns. of  $\text{KClO}_3$  between Pt anodes and Ni cathodes at a temp. of  $24-27^\circ$  and with an anodic c. d. = 0.15 amp./cm<sup>2</sup>. With an anodic and cathodic c. d. = 0.1 amp./cm<sup>2</sup>, the current yield was found to decrease rapidly as the temp. was increased above  $20^\circ$ . At  $27^\circ$  the current yield increases markedly with increase in the cathodic c. d., while variation of the anodic c. d. has but little influence on the yield. It has been found that satisfactory yields of  $\text{Ba}(\text{ClO}_4)_2$  can be obtained by electrolyzing solns. of  $\text{BaCl}_2$  at  $60^\circ$  between Pt anodes and Ni cathodes with a c. d. of 0.15 amp./cm<sup>2</sup>, until all the  $\text{BaCl}_2$  is consumed. Addition of  $\text{HOAc}$ ,  $\text{HCl}$  and  $\text{CaCl}_2$ , as well as leading  $\text{CO}_2$  into the electrolyte, favors the reaction.

H. JERMAIN CRRIGHTON

Bleaching powder. MORIJI ISHIKAWA AND NAGAKAZU NAKAMURA. *J. Chem. Ind. (Japan)* 23, 1034-37(1920).—After careful comparisons of different methods, I. and N. used the arsenious acid method for estn. of bleaching powder. The effect of absorbed  $\text{H}_2\text{O}$  is first studied. By detg. total increase in wt., amt. of active  $\text{Cl}$ , total  $\text{Cl}$ , and  $\text{ClO}_2$ , they concluded that the actual change is very slight during 4 days, in spite of the fact that there is much apparent change, after much  $\text{H}_2\text{O}$  is absorbed. The effect of light on the powder in a sealed bottle and changes in the different parts of the box containers were studied, showing that at the worst 2.2% difference is noted in the surface and inner portions of the container. Extensive chem. analyses of their own products as well as of various other Japanese products were made and compared with those of imported powders. The av. monthly storage loss of bleaching powder kept in a sealed wooden box is 1.2% at the end of one month, 0.9% at the end of 1 year; when kept in a sealed brown bottle it is 0.6% at the end of a year. From expts. in bleaching pulp, the following conclusion is given: The effect of the presence of  $\text{Ca}(\text{OH})_2$  on the bleaching action is very great, the time of bleaching action being proportional to its amt., but  $\text{CaCl}_2$  has no effect. The acid should be added at the beginning, the amt. taken being just enough to neutralize the  $\text{Ca}(\text{OH})_2$ . The bleaching powder should be used about 2-3% more than necessary.

S. T.

**Salt manufacture in Michigan.** W. L. BADGER. *Chem. Met. Eng.* 24, 201-7 (1921).—B. deals with engineering features of present practice in the Detroit and St. Clair River district. The salt deposits are of high quality and some producers use no  $(\text{CaOH})_2$ , while the max. quantity used in this district is 50 lbs. (22.7 kg.) per tank,  $50' \times 15' \times 6'$ . The salt grainer and vacuum pan processes are described and illustrated. NaCl passing 80-90 mesh is called "paste" or "flour." Little pan NaCl is put out finer than 18-20 mesh.

W. H. BOYNTON

**Economical policy of salt manufacture in Japan.** TORAKICHI NISHIKAWA. *J. Chem. Ind. (Japan)* 23, 445-54 (1920).—A brief history of salt manuf. in Japan is given. Fluctuation in its production is due to undesirable methods of manuf. now in use. Salt famine can never be prevented in Japan until she can introduce processes which do not depend on the weather and climate.

S. T.

**Phosphate rock in 1919.** RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 211-25 (preprint No. 13, published Feb. 25, 1921).

E. H.

**Magnesite in 1919.** CHARLES G. YALE AND RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 227-35 (preprint No. 14, published Mar. 7, 1921).

E. H.

**Bromine technology.** W. HOTTNER. *Chem.-Ztg.* 45, 49-51 (1921).—The Br industry had its origin in 1865 when Frank successfully isolated Br from waste liquors at Stassfurt. He obtained it by action of Mn ore and  $\text{H}_2\text{SO}_4$  on a brine containing 3 g. Br per l. The brine now used at Stassfurt has the following compn. KCl 1.4%,  $\text{MgSO}_4$  5,  $\text{MgCl}_2$  34.8, NaCl 1.2, and  $\text{MgBr}_2$  0.3 to 0.5%. In the modern process the brine heated to  $80^\circ$  enters the top of a tile-filled tower, which is 3 to 4 m. high. Cl and steam are introduced at the bottom and Br is liberated according to the reaction:  $\text{MgBr}_2 + \text{Cl}_2 = \text{MgCl}_2 + \text{Br}_2$ . The Br passes into  $\text{H}_2\text{O}$  and is condensed to a crude liquid containing 2.5% of Cl, and must be refined to contain less than 0.2%. Sepn. of Br and Cl is accomplished in a Kubierschky app. by continuous distn. where formerly it was necessary to prep.  $\text{FeBr}_2$  as an intermediate step.

S. D. KIRKPATRICK

**Proteins of the soy bean and their industrial applications.** VIII. SADAKICHI SATO. *J. Chem. Ind. (Japan)* 23, 425-39 (1920); cf. C. A. 14, 3299.—The processes for rendering soy-bean protein moldable are discussed. First the effect is studied of neutral salts, of bases and basic salts, and of various acids and acid salts on the glutination power of glycinin of the protein. Next, the effect of hydrolysis of the protein on its power of glutination, and finally the relation between coagulation and glutination are considered. **Conclusions:** The glutinating power of protein depends on its physical state of dispersion as well as on certain chem. changes, and has a reciprocal relation with its state of coagulation. Protein coagulated by heat and heavy metals has very poor glutination power as compared to that which is pptd. by acids at room temp. These coagulated proteins not only give a non-transparent solid, but when dried, lose their cohesive property. Unless, therefore, 8000 lbs. pressure or more per sq. inch is applied on it, the protein cannot be molded. It is brittle at the best. Glutinated protein, on the other hand, can be easily molded at 1500-2000 lbs. pressure. Therefore, coagulation should be strictly avoided in this process. The ideal conditions for maintaining this desirable property of the protein are: To remove the hull of the bean at  $80^\circ$ ; to ext. the oil at  $40^\circ$  with  $\text{C}_6\text{H}_6$ ; to ext. protein quickly by  $\text{Na}_2\text{SO}_3$  at room temp.; to use  $\text{H}_2\text{SO}_4$  at low temp. as pptg. agent of the protein; to dehydrate it at low temp. and to glutinate the water-free protein very quickly. IX. *Ibid* 527-43.—The actual processes of glutination of soy-bean proteins are taken up in detail. The results with the dry and moist processes of glutination and the effect of degree of glutination and kind of agents used on the physical properties of the products are discussed. **Conclusions:** Strong acids and bases render the product brittle, particularly when a trace of these

agents is left in it. Weak acids and bases are better, but those having amphoteric property are the best glutinating agents. Metallic salts produce a very hard substance. Oxidizing agents make it gray. Reducing agents give a transparent effect. Hydrolysis increases elasticity. Cryst. and difficultly sol. chemicals make it brittle. Finally, condensing agents and conditions which affect the speed of condensation are considered. The nature of the protein, % of  $H_2O$  present, degree of hydrolysis, nature and amts. of glutinating agents, various substances used with formaldehyde, and temp., are the main factors controlling the speed of condensation of the protein by formaldehyde. The typical process for making protein-combs is given as follows: The protein extd. from the bean by  $Na_2SO_4$ , containing 55%  $H_2O$ , is treated with  $H_2PO_4$  (2.5% of  $H_2O$ -free protein), and kneaded to a semi-liquid state. 35% formaldehyde is added until the amt. reaches 15-20% of the protein, and kneading is again done, care being taken not to knead too long, loss of transparency being the end-point. It is then passed under 800-1000 lb. pressure at 30-6°, raised to 90° within 20 min., and finally dried at 35-40°.

S. T.

**Proteins of soy bean and their industrial applications.** X, XI. SADAKICHI SATO. *J. Chem. Ind. (Japan)* 23, 811-30, 905-10 (1920).—The processes of molding and hardening are discussed. Molding and hardening can be done independently, or together in one process, each method having its own characteristic advantages. The controlling factors for these processes are: (1) Consistency of protein; (2) pressure; (3) temp., and (4) duration of application of heat and pressure. Several exptl. data are given. In X, physical and chem. properties of *Satolite*, thus prepd. from soy-bean protein are given. (1) Heat. Although it is made by molding at 90-5° under 3000-3500 lb. pressure per sq. in., it is resistant to high temp. under ordinary pressure. Heating at 150° has no effect, while at 180° it becomes gradually soft like rubber. It is not ignited by the flame of a match, but will burn if exposed to a sufficiently high temp. for some time. (2) The effect of steam depends on the mode of prepn., and original  $H_2O$  content. (3) If left in  $H_2O$  for a long time, it gradually takes up  $H_2O$ . If the glutinizing agent had no  $H_2O$ , it will take up only 1-2%  $H_2O$  at 48 hrs. (4) If made by dry process it is exceedingly elastic. (5) Its hardness is between that of calcite and of talc. (6) Sp. gr. is 1.35. (7) It is somewhat transparent. (8) It does not age for 5 years. (9) It withstands alkali and weak acids; cresole and  $PbOH$ , however, convert it to a glue-like substance. (10) Ordinary org. solvents do not affect it. Various usages of *Satolite* are enumerated.

S. T.

**Recovery of diamond powder from waste paste.** R. G. BERGER. *Chem. Met. Eng.* 24, 208 (1921).—Continued use of diamond powder on Fe polishing wheel or bronze cutting wheel causes it to become clogged with metal, dirt, and carbonaceous matter. Since fine-mesh diamond burns readily over a free flame other means of removal of impurities is necessary. Repeated extn. with  $AcOEt$  or  $C_6H_6$  removes the oil, the residue is thoroughly dried and treated with  $HNO_3$  until washings and decantations are clear, and re-dried. It is then treated with  $HCl$ , dild., and allowed to settle. Dild. and decantation are repeated until a clean solid deposit results, after which it is fused with  $NaOH$  in an Fe crucible. This fusion is leached with water, and the diamond powder residue washed by decantation and dried. Graphite is removed by adding the powder to a soln. of 3.2 sp. gr., which holds graphite in suspension while the diamond particles settle. Fine-mesh diamond probably is converted to graphite, owing to the combined elevated temp., local temp. and great pressure at the point of contact between facet of gem and diamond powder.

W. H. BOYNTON

Potash resources of Nebraska (Hicks) 8.

Phosphoric acid. W. H. ALLEN. U. S. 1,368,379, Feb. 15. Reaction between the constituents of a mixt. of finely divided phosphate rock, sand and coke or coal is

effected in the combustion zone of a furnace to which the mixt. is fed by an underfeed stoking app. A steam-generating boiler may be placed over the reaction zone to utilize excess heat from the reactions.  $H_2PO_4$  may be recovered from the gases by washing, or by the Cottrell or other pptn. method.

**Furnaces for roasting pyrites.** EMILE C. BRACQ. Can. 209,830, Mar. 29, 1921.

**Synthetic ammonia.** L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 155,302, Dec. 15, 1920. The reaction tube for the synthesis of  $NH_3$  under conditions of hyper-pressure is constructed of an alloy, such as the alloy called ATG and described in French specification 496,929, which is not affected by the gases and can withstand high temps. and pressures. To remove the heat generated by the reaction, the tube is immersed in a liquid, such as S containing, if necessary, small quantities of  $P_2S_5$ , which boils at or near the temp. of the reaction. A suitable app. is specified.

**Ammonia.** A. ROLLASON. Brit. 155,313, June 17, 1919. A mixt. of air and steam is preheated in a pipe and a jacket of a producer and is then passed through gates into the fuel, the level of which is kept const. by a bell. The temp. in the producer is maintained below  $950^\circ$ , and the air is wholly deprived of O. The exit gas is cooled to  $500^\circ$  by a cooler or by steam admitted from a pipe and is then passed through a tube surrounded by an outer tube and is there heated to  $550$ – $660^\circ$ , by which means the mols. of N are dissociated into atoms. The gas passes from the pipe through a column of coke mixed with 5% of limestone maintained by external heating at  $700$ – $800^\circ$ .  $NH_3$  is produced, and is recovered after cooling to  $90^\circ$ . The remaining gas is introduced into the combustion chamber and burned, the products passing through the casing to the space between the walls. A suitable construction is specified.

**Pure aluminium hydroxide from aqueous alkali aluminate.** T. NISHIRA AND TOKYO INDUSTRIAL LABORATORY. Japan 36,046, Mar. 29, 1920. If a minute quantity of ammonium salt is added to aq. alkali aluminates in solid particles,  $Al(OH)_3$  seps. as a solid mass surrounding the ammonium salt particles and promotes the decompn. of the remaining aluminates. A slow circular motion is produced and almost all of the Al is pptd. as  $Al(OH)_3$ . By adding, e. g., 0.01%  $(NH_4)_2CO_3$  to aq. Na aluminate (sp. gr. 1.20; containing 10.7% NaOH and 10.2%  $Al_2O_3$ ) and allowing to stand for 48 hrs. at room temp., 70.2% of the Al is pptd. in the pure state as  $Al(OH)_3$ .

**Alumina poor in iron.** V. M. GOLDSCHMIDT and O. RAVNER. Can. 209,088, Mar. 1, 1921. Labradorite is treated with  $HNO_3$  according to the countercurrent principle until a neutral nitrate soln. is obtained. The mixt. is filtered,  $Al_2O_3$  is added to the soln. kept at  $40^\circ$  to ppt. Fe and colloidal silica, the ppt. is removed, the soln. evapd., the residue calcined to decompose  $Al(NO_3)_3$ , the undecomposed nitrates are removed by lixiviation with water and the soln. is sepd. from the undissolved  $Al_2O_3$ .

**Aluminium silicates.** R. GANS. Can. 208,968, Mar. 1, 1921. Easily permeable granular zeolitic material is prepd. from acid silicates containing alumina by treating with a soln. of common salt and subsequently with an alkali silicate.

**Converting the potassium content of glauconite into soluble salts.** F. TSCHIRNER. Can. 209,066, Mar. 1, 1921. Glauconite is dehydrated, the ferrous salts are oxidized to ferric, the K is united with Cl and the product leached. A temp. of  $800$ – $820^\circ$  is used in chlorinating.

**Purification of zinc solutions.** HENRY L. SULMAN and SAML. FIELD. Can. 209,545, Mar. 15, 1921. Zinc sulfate solns. are purified from Ni, Cu and Cd by treating at  $80$ – $100^\circ$  with Zn in a form which affords a large contact surface, such as Zn fume. A small amt. of acid may be present and the Zn may be revived by washing with dil.  $H_2SO_4$ .



Thorium compounds from monazite sand. C. W. DAVIS. U. S. 1,368,243, Feb. 15. Monazite sand 100 is heated with  $\text{H}_2\text{SO}_4$  200 parts for 4-5 hrs. to produce sol. sulfates. The pasty mixt. thus formed, after cooling, is dissolved in  $\text{H}_2\text{O}$  100 parts and insol. materials are sepd. from the soln. This soln. may contain about one-twelfth as much Th as other rare earth metals. The Th is concd. and partially sepd. from the other rare earth metal compds. by partial neutralization and fractional pptn. The ppt. thus obtained may contain about 90% of the Th content of the monazite sand originally treated and may comprize about 50% Th phosphate. The ppt. is treated with a hot 25% soln. of  $\text{Na}_2\text{CO}_3$  to ext. the Th and the latter is pptd. as hydrate with  $\text{NaOH}$  and preferably further purified with boiling  $\text{Na}_2\text{CO}_3$  soln.

Lead and other sulfates. P. A. MACKAY. Brit. 154,718, Sept. 4, 1919. Sulfide ores of Pb and Zn are treated with  $\text{H}_2\text{SO}_4$  containing free  $\text{SO}_2$  or with  $\text{SO}_2$  in the gaseous form to convert the Pb, etc., into sulfates while the Zn remains in the form of sulfide. The  $\text{PbSO}_4$  is sepd. from the  $\text{ZnS}$ , for instance, by flotation.  $\text{Ag}_2\text{SO}_4$  may be sepd. from  $\text{PbSO}_4$  by treatment with  $\text{H}_2\text{O}$ . Cd and Bi if present are converted into sulfates, which are readily sepd. from  $\text{PbSO}_4$ .

Dichromates. R. L. DATTA. Brit. 154,810, Jan. 5, 1920. Na and K chromates are converted into their respective dichromates by the addition of the corresponding acid sulfate. E. g., by adding sufficient  $\text{KHSO}_4$  in the form of a coarse powder to the hot soln. of  $\text{K}_2\text{CrO}_4$ , all the latter is converted into  $\text{K}_2\text{Cr}_2\text{O}_7$ . The soln. is filtered and concd. until  $\text{K}_2\text{SO}_4$  seps. From the mother liquor, after all sulfate has been removed,  $\text{K}_2\text{Cr}_2\text{O}_7$  is obtained by crystn.

Polish for metal surfaces. V. KLOPPER. Ger. 321,684, Apr. 6, 1919. The polish is composed of the usual mineral substances and cyanogen compds.  $[(\text{NH})_4 \text{ or K thiocyanates}]$ . A good liquid polish cleaning metal may be prepared by mixing together 50 kg. finely powdered siliceous chalk, 180 kg. thiocyanates and 170 kg.  $\text{H}_2\text{O}$ .

Briquets. CARLTON ELLIS. Can. 209,629, Mar. 22, 1921. Finely divided fuels or other material are briquetted by mixing with them the solids of waste sulfite liquor together with lime and sufficient water to cause a reaction between the liquor solids and lime.

Removing iron rust from fabrics. J. E. GILMOTT. U. S. 1,368,714, Feb. 15. A compn. for removing Fe rust from fabrics is prepd. by mixing  $\text{HF}_2$ , borax 1 and  $\text{H}_2\text{O}$  24 parts.

Activating carbon. J. C. WOODRUFF. U. S. 1,368,987, Feb. 15. C is rapidly activated by treatment with steam and hot combustion gases as it passes through a horizontal, slightly inclined, rotary kiln.

Composition for removing carbon from internal-combustion engines. Z. J. OLAF. U. S. 1,368,965, Feb. 15. A C-removing mixt. is formed of carbolic acid 2, alc. 3 and  $\text{NH}_3$  soln. 2 parts.

Phenol condensation products. L. V. REDMAN, A. J. WEITH and F. P. BROCK. U. S. 1,368,753, Feb. 15.  $(\text{CH}_3)_4\text{N}_4$  75 is dissolved in cresol 300 parts and the soln. is mixed with asbestos pulp 600 and asbestos fiber 150 parts, with or without the addition of a small proportion of asphalt dissolved in  $\text{C}_6\text{H}_6$ . The mixt. is then subjected to a molding and heat-treatment under pressure to obtain a hard and substantially infusible product. Pitch and varnish resins may be added to the mixt. and various fillers may be employed, e. g., mica, flock or wool pulp. The use of  $(\text{CH}_3)_4\text{N}_4$  instead of an aq. soln. of  $\text{CH}_3\text{O}$  obviates any difficulties such as arise from the presence of  $\text{H}_2\text{O}$  in the reacting mixt. Hydrobenzamide or benzaldehydeamine also may be used, with cresol, phenol or xylenols.

Phenol-aldehyde condensation products. VICKERS, LTD.; IOCO RUBBER & WATERPROOFING Co. and W. H. NUTTALL. Brit. 154,656, July 29, 1919. The con-

condensation of phenols with aldehydes such as  $\text{HCHO}$  soln. or paraformaldehyde, is effected or completed in the presence of the following condensing agents which react with the  $\text{H}_2\text{O}$  present or produced, namely, metal carbides, nitrides, cyanamides, silicides, or phosphides. Where such compds. are used only for completion of the process, the initial stage of the condensation may be carried out with aq.  $\text{HCHO}$  by the usual methods, the layer of condensation product sepd. from the aq. layer and then treated with the specified condensing agents. According to examples there are employed: phenol, paraformaldehyde, and  $\text{CaC}_2$ ; cresol, paraformaldehyde, and  $\text{CaNCN}$  or  $\text{AlN}$ ; an example is also given in which cresol is condensed with aq.  $\text{HCHO}$  in the presence of  $\text{NH}_4\text{Cl}$ , and the sepd. resin is treated with  $\text{CaC}_2$ . The insol. infusible products finally obtained are water-free and have high insulating properties. Cf. 1,921, 1908, and 21,566, 1908. The provisional specifications are not confined to the sp. condensing agents mentioned above; they refer also to the use of sodamide, metal alcoholates, and the compds. of  $\text{NH}_3$  with  $\text{ZnCl}_2$  or  $\text{CaCl}_2$ .

**Strengthening organic tissues and substances.** C. HENRY. Brit. 154,881, Sept. 29, 1920. The tensile strength of organic tissues and substances such as leather, horse-hair, catgut, flax, cotton, etc., is increased by impregnating with "diatomic phenols such as guaiacol, veratrol, etc., in alcoholic or other solns. of varying concentrations." The subsequent evapn. or sublimation of the phenols may be prevented by treating the impregnated material with Na or K formate, carbonate, or oxalate, which reacts with the guaiacol or other substance or the surface of the material forming insol. compds.

**Plastic compositions.** M. SCHONBECK. Brit. 154,574, Oct. 27, 1920. Org. raw material such as decayed roots, sawdust, heather, ivory-nut refuse, etc., is ground with  $\text{H}_2\text{O}$  or other liquid to such an extent that the pulp sets to a horny mass suitable for sheets, boards, slabs, knobs, telescope caps, bricks, toys and elec. insulation.

**Plastic compositions; artificial wood and ivory.** G. H. COX. Brit. 155,124, Jan. 3, 1920. A grained colored product resembling wood, ivory, etc., is made by applying layers of a colored compn. in a mold in combination with layers of paper, fabric, etc., the layers next the mold being worked by a graining tool. An example of a suitable compn. is 1 part of gum tragacanth, 3 parts of gum arabic, 60 parts of  $\text{H}_2\text{O}$ , 2 parts of linseed meal, 4 parts of whiting, 2 parts of baked flour, and 32 parts of plaster of Paris. Layers of canvas, wire netting or gauze or strips of metal or wood may be introduced between the layers of paper, etc.

**Treatment of waste mica.** H. C. S. DE WHALLEY. Brit. 155,318, July 5, 1919. Scrap mica and similar insulating materials are treated as follows for the recovery of the resins, and the mica. The scrap mica is autoclaved with a dil.  $\text{NH}_4\text{OH}$  or other alkali, or with a soln. of a salt having an alk. reaction such as borax, and live steam is admitted at a pressure of 4-6 atms. for 15-30 min. Under this treatment the varnish is softened and, owing to the tendency of the mica to regain the form it had before compression, the solvent penetrates between the layers and dissolves the varnish. Alternatively the mica is autoclaved with  $\text{H}_2\text{O}$  instead of the alkali and the varnish dissolved after this treatment by immersing the mica while still hot in a cold alk. soln. The strained alk. soln., preferably after concn., is then neutralized and heated to ppt. the resins.

**Washers, jointing-plates, etc.** G. H. COOK. Brit. 155,048, Sept. 19, 1919. Washers, jointing-plates, and other articles are cut, stamped, or pressed from asbestos sheeting or other fibrous material and are coated with metal by electrodeposition. The asbestos may be impregnated with rubber. Other fibrous material may be treated with a salt to render it incombustible. The blanks may be coated with graphite before the metal is deposited. Two metals may be deposited, such as Ni upon Cu.

# 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Raw materials for the ceramic industry in South Africa. ANON. *Bull. Imp. Inst.* 18, 271-8(1920).—A report of clays for brick, tile and fire clay occurring in the various provinces of South Africa. Analyses of samples are reported. R. I. S.

Work of the ceramic station of the Bureau of Mines at Columbus, Ohio, in behalf of the ceramic industry. *Repts. Invest. Bur. Mines* 1921, No. 2212, 5 p.—For use in graphite crucibles 2 Am. bond clays have been proved superior to the German Klingenberg clay in brass-melting work and 13 are found better than Klingenberg for steel-melting crucibles. The various graphites from Ceylon, Madagascar, Canada, New York, Alabama, Texas and Montana are being compared. The possible replacement of magnesite by dolomite in the iron and steel industry is being studied. Before being used the dolomite must be calcined at a high temp. to remove shrinkage and to prevent subsequent disintegration a "dead-burning agent" must be added. The physical properties of 100 white pottery clays have been detd. and an improved clay-refining process has been worked out. Wares equal to those containing the English pottery clays have been made.

C. H. KERR

Graphical methods of computing the composition of ceramic bodies. U. PFAFF AND M. DONATH. *Ber. deut. keram. Ges.* 1, Pt. II, 21-32(1920).—Fig. 1 represents the rational compn. of a clay, a sand, and a feldspar in terms of kaolin, quartz, and feld-

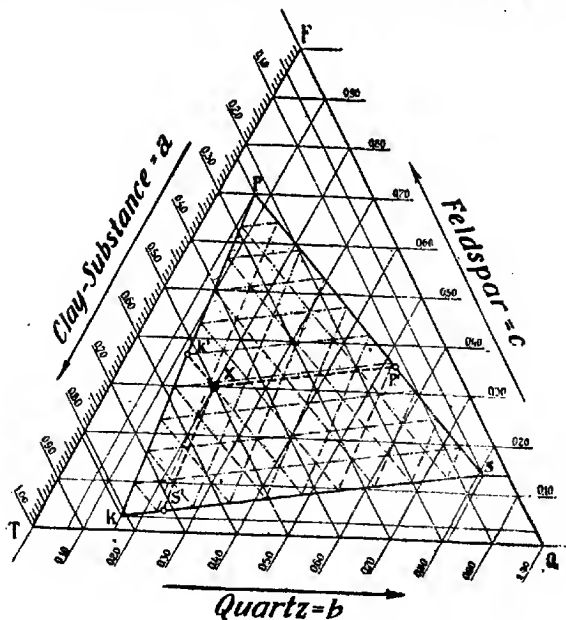
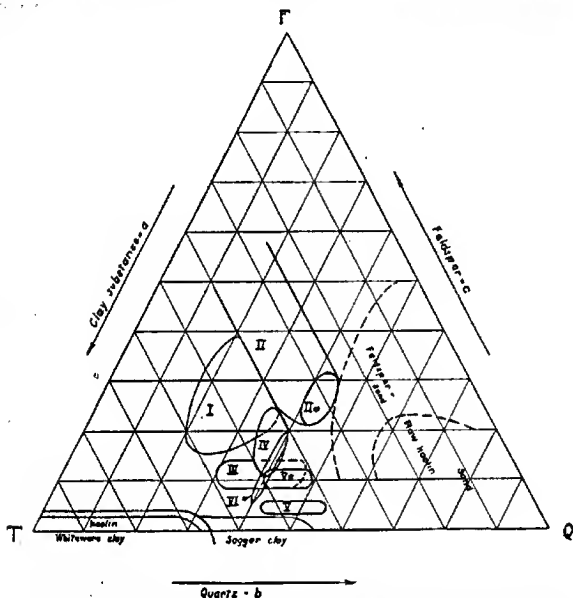


Fig. 1

spar. The clay has the compn. shown by point  $K$ , the sand by  $S$ , and the feldspar by  $P$ . It is desired to find what proportions will give a body having the compn. represented by the point  $X$ . From the point  $X$ , lines are drawn,  $XX'$ ,  $XP'$ ,  $XS'$ , parallel to the sides of the triangle  $KSP$ . The fraction  $K'P/KP$  = fraction of clay,  $S'K/SK$  = fraction of sand, and  $P'S/PS$  the fraction of feldspar. Only bodies represented by points within the triangle  $KSP$  can be prepared from the 3 materials,  $K$ ,  $S$ , and  $P$ . The body  $X$  could also be obtained from a mixt. of  $S$  and  $P$  with another material



I, Hard porcelain; II, soft porcelain; III, Japanese porcelain; IV, stoneware;  
V, whiteware; Va, new German whiteware; VI, calcareous whiteware

Fig. 2

$K_1$  by a similar procedure. Let  $a + b + c = 1$  be the fractions of  $K$ ,  $S$  and  $P$  required, and  $a_1 + b' + c' = 1'$  be the fractions of  $K_1$ ,  $S$  and  $P$  required to give  $X$ , then a mixt. of  $m$  parts of 1 with  $(1 - m)$  parts of 1', giving a mixt. also with the compn.  $X$  will contain  $(m.a)$  parts of material  $K$ ,  $[(1 - m) a_1]$  parts of  $K_1$ ,  $[m(b - b') + b']$  parts  $S$  and  $[m(C - C') + C']$  parts  $P$ . A rational compn. diagram of several porcelain and stoneware bodies is given in Figure 2.

E. N. BUNTING

Ceylon sands for glass manufacture. ANON. *Bull. Imp. Inst.* 18, 174-89 (1920).

—Eighteen samples of sand from dunes near the Jaffna Peninsula on analysis were found to contain from 96.6 to 99.2%  $\text{SiO}_2$ . In but 2 samples were the heavy mineral and  $\text{Fe}_2\text{O}_3$  content low enough (0.02 and 0.12%) to permit the use of the sand for the manuf. of the best quality glass; and in those 2 cases the mechanical condition was such that grinding would be necessary. The sand could be used for the manuf. of a glass of medium quality.

R. L. SIBLEY

A new physical aid in ceramics. K. M. BALLEW. *Chem.-Ztg.* 45, 75 (1921).  
 —Ceramic wares when burned even in muffle or sagger kilns, are often ruined by kiln gases. This may be overcome by maintaining a suitable atm. within the muffle or sagger under a pressure about 5 mm. of  $H_2O$  greater than that of the kiln atm. An oxidizing atm. is maintained with air or acid vapors, a neutral atm. with  $CO_2$  or  $N_2$  and a reducing atm. with  $H_2O$  or  $CO$ . C. H. KERR

Recent research in manufacture of porcelain insulators. ALFRED SELL. *Elekt. Rev.* 78, 389-92 (1921).—A carefully prepared review. C. G. F.

Tentative test for slagging action of refractory materials. ANON. *Proc. Am. Soc. Testing Materials* 20, I, 620-3 (1920).—A tentative standardized test is recommended by Com. C-8 of the Am. Soc. Test. M. The brick to be tested has a refractory ring cemented to its surface. The whole is held at  $1350^\circ$  during the test. Thirty-five grams of synthetic slag, ground to 40-mesh, is put within the ring and allowed 2 hrs. to soak in. The brick is finally cut open and the area of penetration measured. The synthetic slag for general use is made to analyze:  $SiO_2$ , 19.0;  $Al_2O_3$ , 12.89;  $Fe_2O_3$ , 15.73;  $CaO$ , 33.50;  $MgO$ , 6.93;  $MnO$ , 3.52;  $Na_2O$ , 8.50. The m. p. of the slag is  $1270^\circ$ . C. H. KERR

Silica bricks for coke ovens (FENZNAUER) 21.

Purifying clay, sand or similar materials. G. A. HULERT. U. S. 1,368,396, Feb. 15. Fe and other volatilizable substances are removed from clay, sand or similar materials by heating the material to  $350-600^\circ$  and treating it with phosgene until the volatilizable substances are eliminated. The method is especially adapted for prepreg. ingredients of optical glass or clay pots for glass-making.

Quartz-glass articles. J. SCHARL. U. S. 1,368,990, Feb. 15. Quartz is heated to a plastic mass in an elec. resistance furnace about a resistance core, a space being provided between the quartz to be heated and the resistance core by inserting between them a heat-resisting tube such as C impervious to gases for allowing the escape of the gas formed around the core during the heating.

Refractory material. AUGUST PFAFF. Can. 209,700, Mar. 22, 1921. A refractory material contains a burnt mixt. of about equal parts of zirconia and silicon carbide.

Ceramic grinding-wheels. CARBORUNDUM Co. Brit. 155,076, Oct. 15, 1919. Cracking round the arbor holes of large grinding wheels, composed of abrasive materials or graded abrasive grains bonded together by clays, Na silicate, or org. bonding material, is prevented by making the part round the arbor hole of less d. or with coarser grains than that of the remaining portion of the wheel. The same bonding material may be used for the inner and outer portions of different bonding materials which mature at approx. the same temp. The material near the arbor hole may have no abrasive properties.

## 20--CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Sand-lime brick in 1919. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 237-8 (preprint No. 15, published Mar. 5, 1921).

E. H.

Creosote oil as a wood preserver. ANON. *J. usines à gaz* 45, 7-10 (1921).—Wood preservation by means of creosote oil,  $CnSO_4$ ,  $ZnCl_2$  and  $NaF$  is discussed. The conclusion is that the first presents a marked superiority over the other materials.

J. L. WILEY

**Calcium-sulfate cements.** F. HARTNER. Brit. 154,888, Nov. 5, 1920. Anhydrite or anhydrite-bearing rock is converted into a self-setting cement by being ground in a ball-mill or similar app. to a powder having particles about 0.006 mm. in diam.

**Artificial stone.** C. LOEFFELHARDT. U. S. 1,368,949, Feb. 15. An artificial stone suitable for floors or walls is formed of concretions composed of MgO, a filler such as marble dust and MgCl<sub>2</sub> embedded in a cement formed from MgO, a filler such as marble, SiO<sub>2</sub> or talc and MgCl<sub>2</sub>.

**Roof composition.** DEUTSCHE SUCCOL-GES. M. B. H. Ger. 321,213, June 21, 1918. To a thoroughly stirred mixt. of wood tar, anthracene slime and Ca(OH)<sub>2</sub> powder, heated to 30°, are added about 15% dil. sulfite liquor and about 5% potash lye, and the resulting mass is stirred until cold. Specific proportions recommended for the mixt. are, by wt., wood tar 45, anthracene slime 20, sulfite liquor 15, anhydrite (crude gypsum) 10, potash lye 5, powdered Ca(OH)<sub>2</sub> 5. The product must be preserved with exclusion of air.

**Ornamenting wood.** H. STEINER. Brit. 154,614, Dec. 1, 1920. An ornamental coating is produced on wood by first soaking the wood in glue, applying a paint comprizing coloring matter intimately mixed with an excess of cellulose ester solution, lac varnish or the equiv., applying a suitable design or the like and then coating with cellulose ester soln., smoothing and polishing. According to the coloring and design, various substances may be imitated, such as galalith, celluloid, ivory, amber, tortoise shell, hurnished steel, artificial resin, mahogany, and ebony.

**Building materials.** A. POLLA. Brit. 155,268, Dec. 13, 1920. Ligneous fragments such as shavings, sawdust, and cork are treated with alkali, or alkaline-earth hydroxides or carbonates to neutralize org. acids and saponify the resins, dried, and mixed with sand or scoria, and cement, CaO, plaster, etc., and molded.

## 21—FUELS, GAS, TAR AND COKE

**Fuel conservation.** DAVID MOFFAT MYERS. *Mech. Eng.* 43, 24-6(1921).—A saving of 75-100 million tons of coal per yr. could be made by adopting in the U. S. methods of fuel conservation. The problem is of so vital importance that the Government should take direct supervision of it. M. offers some suggestions for consideration in this connection.

J. L. WILEY

**Chemical laboratories of the fuel-testing station.** EDGAR STANSFIELD. *Summary Report Can. Dept. Mines*, No. 542, 27-30(1920).—A review of the year's work ending Dec. 31, 1919, is given. Tables of results of oil shale distns. show amts. of crude oil, dry oil, gas, and N, also fractions obtained at different temps. and the comparative actions of rapid and slow heating. About 30 imperial gal. of oil were obtained from 2000 lbs. of shale. *Lignite carbonization.* EDGAR STANSFIELD, et al. *Ibid* 30-41.—The results are assembled in 6 tables and illustrated with 5 charts of curves. Lignite from about a dozen sources was examd. and the points detd. were moisture, ash, volatile matter, fixed C, heating value and the partition of the volatile matter. Cf. C. A. 15, 591. Report of the Peat Committee. B. F. HAANEL (Secretary). *Ibid* 41-53.—This report is from the engineer's point of view, but should be studied by all chemists interested in the peat industry.

L. W. RIGGS

**Fuel wastes in oil-field hollers for drilling and production.** A. W. AMBROSE. Bur. Mines, *Rept. of Investigations*, No. 2189(1920).—Large savings can be made in the fuel consumption of boilers used for drilling and production by the use of the following means: metering of the natural gas used; use of low-pressure gas burners and efficient oil burners; boiler insulation and housing, even if of a crude type; proper fire-box design; use of a damper and CO<sub>2</sub> recorder; properly regulated draft; and clean flues. Most of these changes also increase boiler capacity.

ERNEST W. THIELE

The judging and grading of fuel according to the temperature of combustion. WILHELM SCHWIER. *Stahl u. Eisen* 40, 1033-7, 1108-11, 1170-7, 1236-40 (1920).—The flame temp. of several fuels is calcd. and its influence on the efficiency of combustion is discussed. Arguments are given to show the desirability of classifying fuels on this basis.

CARLE R. HAYWARD

Coal in 1918. Part B. Distribution and consumption. C. E. LESHNER. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1918, Pt. II, 1315-82 (preprint No. 35, published Dec. 6, 1920).

E. J. C.

Fusain and its estimation in coals. H. STERN. *Chem. Eng. Mining Rev.* 13, 101-2 (1920).—Since fusain plays an important part in the propagation of "gob" fires and spontaneous combustion of coal, the following method was devised for its detn.: 1. In a representative piece of pure coal free from fusain, the moisture, ash and volatile matter are detd. by the standard methods of the Am. Chem. Soc. 2. Some fusain is gently scraped from the surface of another piece of coal, and analyzed as under 1. 3. A known wt. of crude coal containing fusain is crushed until all passes 10-mesh, and then quantitatively sieved into 3 sizes: 10-100-mesh, 100-200-mesh, and under 200-mesh. 4. On each of these 3 portions of crude coal is detd. volatile org. matter (= total volatile— $H_2O$ ). 5. Experience proves that in the following formula  $x$  represents the percentage of fusain:  $(x \times a) + (100 - x)b = 100c$ . In this formula  $100 - x = \%$  of pure coal in mixt.  $a, b$  and  $c = \%$  of org. matter on moisture- and ash-free basis in fusain, pure coal, and crude coal mixt., respectively. Results on 3 coals gave the following percentages in the several meshes: 10-100-mesh, 0, 0, 0; 100-200-mesh, 0, 4.3, 6.3; under 200-mesh, 34, 21.2, 13.5. The soft powdery nature of fusain leads to its accumulation in mine dusts; these rarely show under 20% and generally go as high as 50%. For detn. in mine dust proceed as per 4 and 5 above. Fusain also accumulates in the slurry tanks of coal washeries. It has no value as a decolorizing carbon, but may be used in paint or blacking, or to add to the combustibility of briquets.

JEROME ALEXANDER

New process for reclaiming coal from combustion residue. H. O. HERZOG. *Elec. World* 77, 486-7 (1921).—Clinker is sepd. from coal by magnetic action. The ash is first put through an 80-mm.-mesh screen, going successively into hopper, chute, bucket, elevator to the sepg. plant. After sepn. of Fe from the ash, the remaining material goes into a conical screen drum which seps. the ash into four sizes: 0-8, 8-20, 20-35, and over 35 mm. The first three sizes are charged on to electromagnetic separators and the material over 35 mm. in size goes to the crusher. Clinker is retained to some extent by electromagnetic attraction of the drums while the coal is thrown off by centrifugal force produced by the rotation of the drum; this results in delivery of coal and clinker in places best kept apart by a wall. 30% of coal from residues at station plants, and 40-45% from locomotive ash may be recovered. Advantages claimed for this process include coal recovery of every size of particle, and sepn. of clinker better adapted for briquetting, due to freedom from coal.

W. H. BOYNTON

Mixed coal experiments. WM. C. BUTTERWORTH. *Gas Record* 19, No. 5, 11-13 (1921).—The Platteville, Wis., Gas Co. has been conducting expts. during the past 7 months on mixing various coals for gas-making. Run-of-Dock, No. 6 Illinois seam, No. 3 Pocahontas and Upper Elkhorn seam, have thus far been used in varying proportions. The quality of the domestic coke has been improved and at the same time coal costs have been reduced. The work is still under way.

J. L. WILEY

Coal-dust firing in America. HUGO BANSSEN. *Stahl u. Eisen* 40, 1182-5, 1196-1201, 1228-35 (1920).—A symposium based on papers in various technical journals.

CARLE R. HAYWARD

The chemistry of combustion processes in the internal-combustion engine from the standpoint of practice. WA. OSTWALD. *Brennstoff Chem.* 2, 17-21 (1921).—A dis-

discussion of the physical chemistry of various factors in the design and operation of internal-combustion engines, such as the following: type of fuel (energy content, soly. of  $H_2O$ , complexity of mixture, corrosibility), carburation (including the formation and stability of fine sprays), optimum compression, jacket temp., "carbon" formation and explosion velocity. The sensitivity of fuels to compression (in the cylinder) changes from greatest to least in the following series: paraffins, high-boiling petroleum fractions and lignite tar oils, petroleum, dekahydronaphthalene, heavy benzine, light benzine, phenolic oils, solvent naphtha, tetrahydronaphthalene,  $C_6H_6$ , EtOH. O. points out the fact that the "brisance" of a fuel bears no apparent relation to its heat of formation. "It would be a valuable piece of research to follow the physico-chemical relationships during auto-catalytic combustion in a space increasing (with time) according to the sine-law."

W. B. V.

Analyzing records of carbon dioxide and combustible gases. ANON. *Elec. World* 77, 654(1921); 1 illus.—The chart shown emphasizes the importance of keeping continuous records of combustible gases present in the flue.

C. G. F.

Percentage of carbon dioxide is not final test of good combustion. O. RODIER. *Elec. World* 77, 429(1921).—Dependence on  $CO_2$  records alone is misleading, for while low  $CO_2$  generally indicates excess of air, it may indicate poor mixt. of the air. Insufficient air supply causes the presence of CO in the stack, but other influences include poor furnace design, improper firing methods, the use of the wrong quality of coal for the equipment, poor mixt. of the combustible gases and air, and low furnace temp., whereby the gases are cooled below the ignition point before combustion is complete.

W. H. BOYNTON

Kinds of chimney losses and their relative importance. O. RODIER. *Elec. World* 77, 544(1921).—Heat losses in chimneys are either sensible heat of the flue gases or the heat represented in chem. energy in unconsumed combustible gases. Curves show flue losses with varying amounts of  $CO_2$ . At the critical point combustion takes place with the greatest economy in fuel consumption.

W. H. BOYNTON

Calorific values of woods native to the Argentine Republic. CARLOS DIAS. *Informes dept. investigaciones ind. Univ. Tucuman.*, No. 12, 13-4(1920).—The calorific values of 21 species are given as detd. by an Emerson bomb calorimeter, on dry samples.

L. E. GELSON

The development of the Pluto stoker for utilizing medium-grade fuel. OTTO NERGER. *Stahl u. Eisen* 40, 969-75(1920).

CARLE R. HAYWARD

Peat deposits in the United States and their classification. ALFREDO P. DACHNOWSKI. *Soil Sci.* 10, 453-65(1920).—A review of literature dealing with the extent and systems of classifying peat deposits.

W. J. ROBBINS

Technical moor problems. GUSTAV KEPPELBER. *Z. angew. Chem.* 33, I, 281-3(1920).—See C. A. 15, 429.

W. C. EBAUGH

Carbonization of peat. MÜLLER. *J. Gasbel.* 63, 817-20(1920).—Peat for carbonization purposes should contain if possible less than 25% of moisture and 5% of ash. Such a peat yields at a retort temp. of  $1100^\circ$  about 30% of gas, 5% of tar and 0.25% of  $NH_3$ . The drier the peat, the shorter is the coking time, usually about 4-6 hrs. Likewise, the consumption of fuel for firing becomes less with decreasing water content. The coke is equiv. to the best gas coke in heating value and can be quenched as satisfactorily. The coke breeze can be briquetted with advantage. The sp. gr. of peat tar is less than that of coal tar (1.02-1.05) and is difficultly sepd. from water. Since it contains more oils, it is more valuable than coal tar. It yields a large amt. of dilute  $NH_3$  liquor, the total content of  $NH_3$ , however, being larger than that obtained from coal. Peat gas is heavier than coal gas (0.7-0.75) on account of the high content of  $CO_2$  (12%). The gas yield is about 24 cu. m. per 100 kg. of peat. It can be purified in the same manner and just as easily as coal gas. The heating value is not less than 4000 cal.

J. L. WILEY



**Recent advances in low-temperature carbonization.** H. L. ARMSTRONG. *Iron & Coal Trades Rev.* 102, 156(1921).—From a cost comparison of low-temp. and high-temp. carbonization in coke ovens and gas works, A. concludes that (1) Whatever the prices, an enormous gain is obtained by carbonizing; the value of the products in a ton of coal are more than double the value of the raw material. (2) The low-temp. process shows considerably better economic results than high-temp. in either ovens or gas works. Cf. C. A. 15, 746.

S. D. KIRKPATRICK

**The operation of gas plants.** R. GRIPERT. *Z. Ver. deut. Ing.* 65, 38-41(1921).—The production and purification of gas are described in a general way. J. L. WILBY

**Six month's experience with a Woodall-Duckham vertical retort installation.** W. A. DEARON. *Gas World* 74, 137-8(1921).—Details of starting and operating the settings are given. Steaming at 30-40 lb. pressure is practiced. Successful results have been obtained with step grates, during 5 months of operation the fires have been thoroughly clinkered only twice. Results of operation for 5 months have been as follows: Coal carbonized 8923 tons; gas made per ton, 13,566 cu. ft.; av. calorific value, 445.45 B. t. u.; tar per ton, 16.18 gal.;  $\text{NH}_3$  as sulfate per ton, 39.67 lb.; surplus coke per ton, 8.18 cwt. Gas is used for generating electrical power and for driving the extractors; yet the total weekly consumption in the plant is less by over 2000 cu. ft. than with the old plant of horizontals.

J. L. WILBY

**Economical burning of blast-furnace gas.** ANON. *Iron & Coal Trades Rev.* 102, 246(1921); 3 figs.—The J. E. Weyman system for burning blast-furnace gas under boilers is described. The intimate mixing of the gas and air, at all times essential for efficient burning, is particularly necessary with blast-furnace gases owing to the small amt. of combustible content per cu. ft. of gas and the large vol. of gas evolved. Therefore, automatic air regulation is essential. The Weyman app. consists essentially of a governor bell sealed in a tank of water, and actuated by the change in pressure in the gas main, thus operating the air ports to the combustion chamber, and automatically controlling the air in proportion to the pressure and, consequently, the vol. of gas passing. The control with this governor is perfect with a gas pressure as low as  $\frac{1}{16}$  inch. Boilers fitted with Bunsen burners with the Weyman regulator gave an evapn. of upwards of 33% higher than a similar boiler with a standard-type burner and hand-regulated air supply.

J. L. WILBY

**Gas making with cheap oxygen.** E. A. W. JEFFERIES. *Gas Age* 47, 145-50(1921); *Gas Record* 19, No. 5, 45-55(1921).—The application of a Jefferies-Norton gas sepn. system to gas manuf. is described. The plant furnishes from the air, O for the gas production and N for any suitable purpose if desired. From a test carried out 100 lbs. of coal produced 3100 cu. ft. of gas with a calorific value of 400 B. t. u.; 30 lbs. of steam and 640 cu. ft. of O were used. The cost is given as 11.6 cents per 1000 cu. ft., not including the cost of washing, purifying or storing the gas, nor the income from by-products. Exptl. data are given.

J. L. WILBY

**Use of bituminous coal as water-gas generator fuel.** W. W. ODELL. *Bur. Mines, Rept. of Investigations*, No. 2183(1920).—Coke has long been recognized as a more desirable fuel than bituminous coal in water-gas app., but considerable progress had been made in the use of the latter as a substitute for coke. The av. value of the blue gas from coke is 300 B. t. u. per cu. ft., whereas that from coal is 335 B. t. u. Also, the vol. and quality of the blast gas are appreciably greater with the latter. The advantages are: (1) Carbureted gas can be made from coal cheaper than from coke, owing to the fact that, though slightly more generator fuel is used per 1000 cu. ft. of gas produced, the difference in the prices of coal is great enough to offset it; (2) a still greater economy can be realized when a properly designed waste-heat boiler with suitable combustion chamber is provided to utilize the larger quantity of blast gas.

J. L. WILBY

**Economy in gas oil in carburation of water gas.** BRENDER & BRANDIS; AND J.

W. M. UYTENDIJK. *Ned. Gas*, Aug. 1, 1920, 143; *J. usines à gaz* 45, 21-2(1921).—Expts. were made in connection with a Humphreys and Glasgow water-gas plant to det. the most favorable relation between the water gas and the oil, and the most advantageous way of introducing the oil. Amts. of oil from 0 to 40 l. were added to the gas uniformly throughout the whole period of gasification (7.5 min.) and 3 times during the period at 1.4 and 6.5 minutes. Results of analyses of the gas showed that the best results were obtained toward the end, the quality of the gas being better. The oil then should not be introduced until after 2-2.5 minutes of the gasification period have expired or until the temp. has been lowered somewhat. Also for each size and each type of app., the most favorable relation existing between the oil and the gas corresponds to the most favorable decompn. of the oil, or at about 30 l. of oil for a period of gasification (88 cu. m. of blue water gas). Also better results are obtained if the amt. of oil is kept const.

J. L. WILEY

Machines for charging and discharging through horizontal retorts. W. GROGONO. *Gas J.* 153, 472-3(1921).—Machines belonging to each of 3 classes are briefly described: (1) Those requiring a charger and discharger on the blank side of the retort-bench and a charger on the furnace side—such as West's compressed-air and Arrol-Foulis hydraulic machines; (2) those requiring a charger and discharger on the blank side only—such as the De Brouwer and the Drake machines; (3) those which charge and discharge simultaneously—such as the Fiddes-Aldridge. J. L. WILEY

Syphon pumping on gas works. D. C. CROSS. *Gas J.* 153, 470-1(1921).—The method consists of sucking or drawing the tar and liquor out of the gas syphons by means of a vacuum created in iron boiler tanks by the condensation of steam. The method is simple, clean and efficient.

J. L. WILEY

Combination coal and water gas. R. BAKER. *Gas Age* 47, 129-31(1921).—A description of a K. and A. water-gas system is given. The plant consists of 2 generators each having its own vertical charging retort surrounded by checker-work generators, the whole being enclosed in a single shell. There is said to be a considerable saving of heat in the process and a high efficiency. A sample of the gas produced shows by analysis:  $\text{CO}_2$  3.75%,  $\text{CO}$  43.7,  $\text{H}$  45.1,  $\text{CH}_4$  0.5 and  $\text{N}$  6.95, and net calorific value of 284 B. t. u. The plant can be arranged also for carbureting with oil.

J. L. WILEY

Clearing of service pipes with highly compressed air or carbon dioxide. F. GRUBER. *Z. Ver. Gas.-Wasserfach.* 61, 8-9(1921).—Use of compressed air or  $\text{CO}_2$  to clear stoppages in service pipes leads to slugs of non-inflammable or explosive gas in the mains, resulting in dangerous extinctions of gas flames or explosions that damage meters. A case of meter damage in Vienna is discussed. ERNEST W. THIELE

Silica bricks for coke ovens. J. ENZNAUER. *Stahl u. Eisen; Iron & Coal Trades Rev.* 102, 232-3(1921).—The Rheinische Stahlwerke has carried out comparative tests on each of 2 batteries of coke ovens, one made of silica bricks with lime binder of compn.  $\text{Al}_2\text{O}_3$  1.8-1.9%,  $\text{SiO}_2$  94.5-95.0,  $\text{Fe}_2\text{O}_3$  1-1.5,  $\text{CaO}$  1.8-2,  $\text{MgO}$  0.1-0.15, alkali 0.6-0.8; the other with ordinary clay-bound firebrick of compn.  $\text{Al}_2\text{O}_3$  15-17%,  $\text{SiO}_2$  79-81,  $\text{Fe}_2\text{O}_3$  1.8,  $\text{CaO}$  0.3,  $\text{MgO}$  0.3, alkali 1.6. The former has been in use 4 yrs., the latter 3, and yet the former is in much better condition, silica brick being much more resistant to corrosion from salty and wet coals, to slagging and fusing, and to mechanical abrasion. Also, contrary to expectations, the yield of sulfate was not impaired. The time of coking a charge was reduced from 29 to 24 hr. and 18 hr. was thought feasible. The coke from the silica ovens is of better appearance and considerably harder than that from the firebrick ovens. In spite of the irregular working, the walls have not developed troublesome leaks and losses of gas are rare. The economic efficiency of the plant is very high. Numerical data were obtained on the differences existing between the working of the silica and firebrick ovens, resp., comprising the

following detns.: gas made per ton of coal with equal charges 10,675-10,790 cu. ft., per battery per hr. 202,450-170,000 cu. ft.; gas consumption per hr. 126,370-105,600 cu. ft.; heat consumption per ton of coal 692-697 cal.; flue temp. 1068-1027°; stack temp., 372-327°; temp. of blast and regenerator gas 1040-993°; temp. in oven, 908-804°; temp. of distn. gas in upcast, 456-434°, in receiver, 295-270°; compn. of crude gas %  $C_2H_6$  2.0-1.9,  $CH_4$  22.1-21.2,  $H_2$  57.6-58.1,  $CO$  5.1-4.5,  $CO_2$  1.8-2.1,  $O_2$  0.5-0.3,  $N_2$  10.8-11.9, cal. per cu. m., 3809-3770; compn. of flue gas %  $CO_2$  7.3-7.0,  $O_2$  5.5-5.6, surplus air, 29.6-33.3.

J. L. WILEY

Corrosion of coke-oven walls. A. E. FINDLEY. *J. Soc. Chem. Ind.* **40**, 7-8T (1921).—F. has investigated the relative effects of the salt, iron and moisture contained in fine coal used for coking upon the durability of the oven walls, with the following conclusions: (1) as the amt. of salt increased the durability of the oven walls decreases; (2) the life is further diminished if both salt and iron contents are high; (3) the presence of much iron and moisture does not appreciably affect the life of the oven walls if the amt. of salt is very low; (4) the higher temp. in vertical flues of a regenerative oven system tends to shorten the life of the walls. Expts. were carried out on the influence of  $MgCl_2$ ,  $NaCl$ ,  $CaCl_2$  and  $HCl$  upon the volatilization of the iron content of coal, by heating 5 g. of coal (ground to 30 mesh) in silica tubes to 900-950° in air, steam and air, steam, air and  $HCl$ , and coal gas. The max. loss of iron occurred in an atmosphere of air, steam and  $HCl$ , the losses observed with the solid chlorides being too small to lead to definite conclusions.

J. L. WILEY

Report of Administrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada (lignite utilization) (MACALLUM) 13.

WEITHOFER, K. A.: Das Pechkohlengebiet des bayerischen Voralpenlandes und die Oberbayerische Aktiengesellschaft für Kohlenbergbau. *Denkschrift aus Anlass des 50 jährigen Bestandes dieser Gesellschaft (1870 bis 1920)*. München: Universitäts-Buchdruckerei C. Wolf & Sohn.

Treating coal. W. J. MELLERSH-JACKSON. *Brit.* **154**,702, Sept. 2, 1919. A method of concg. bituminous coal or refuse or waste consists in subjecting the coal to a grinding or crushing operation of such a kind as to yield a product having sharp angular edges and lustrous surfaces, and subjecting such product to sepn. by froth flotation. The flotation may be effected with the aid of suitable oils or oil mixts., in the presence, if necessary, of acid or alk. liquors, and such liquor may be sepd. from the tailings and used again.

Fuel. D. B. MACDONALD and DENSIFIED PEAT FUEL, & PRODUCTS, LTD. *Brit.* **154**,289, Aug. 18, 1919. Compn. fuel is composed of coal dust and peat, and is preferably made up in the form of briquets. The peat (containing 80-90% of  $H_2O$ ) and the coal dust (which may be lignite or brown coal) may be mixed in equal proportions. The peat may be reduced to a plastic mass or pulp with or without hot or cold  $H_2O$ , the powdered coal is mixed and worked with the mass in a pug mill and the mixt. formed into briquets, which are allowed to dry, or are dried in a current of warm air. Cf. **2,237**, **1873**, **654**, **1875**, **1,806**, **1889**, **17,154**, **1890**, **16,027**, **1902**, and **122,214**.

Liquid fuel. JNO. FLINT and F. G. BROWN. *Can.* **209**,167, Mar. 8, 1921. A fuel for internal-combustion engines or for lighting and heating purposes comprizes alcohol, naphtha and camphor.

Internal-combustion engines. G. L. D. JAMES. *Brit.* **154**,795, Dec. 1, 1919. A mixt. of steam, exhaust gas,  $H$ , and it may be a hydrocarbon is generated in the app. and admitted to the induction pipe in advance of the charge from the carburetor. Steam is generated in the pipe which traverses the exhaust pipe and enters a chamber

with air from the port. The steam and air and some exhaust gases from a pipe enter a cylindrical valve, where unburnt fuel in the exhaust is burnt and decomposes some of the steam, the mixt. passing through a tapering port in the valve and pipe to the engine.

**Fuel; fuel transport.** L. W. BATES. Brit. 154,605, Nov. 30, 1920. Coal, coke, or other carbonaceous solid is pulverized and stabilized in liquid hydrocarbon sufficiently to permit of its transport through pipes. The composite, centrifuged, filtered or decanted, or not from particles above colloidal limits, may be used as a liquid fuel or to make gas, and the sepd. oil-coated particles as paste or solid fuel or to make briquets. The stabilizers mentioned are alkali, lime-rosin soap, 5-20% of peptizers such as creosote, naphthalene, or  $H_2O$ -gas tar from bituminous coals, and 10-30% of a liquid combustible immiscible with the carrier hydrocarbon, *e. g.*, tar if oil be the carrier. The blending is effected by reducing the coal so that at least 95% passes through a screen of 100 meshes per linear in. and 85% through a 200-mesh screen, and either heating the particles, stabilizer, and carrier to 65-95° for up to 3 hrs., or passing them simultaneously through a coal-pulverizing mill, a mechanical blending may be used simultaneously or successively. The viscosity of the oil carrier is preferably raised or reduced to about 20° Engler at 20°, so that up to 45% of coal may be satisfactorily stabilized. The coal may be freed from ash by air blast separators, sifters, or flotation, or other known chemical or mechanical treatment, before, during or after manuf. or transport of the composite. The transport pipes are formed with irregularities to promote agitation and hinder any settling out of particles during transit.

**Liquid fuel.** L. W. BATES. Brit. 155,209, Dec. 9, 1920. In making fuel consisting of solid carbonaceous particles stabilized in a liquid combustible, the coal, coke, lignite, etc., crushed between rolls is lifted by a bucket conveyor to a hopper and, in quantities regulated by a valve in the outlet pipe, is fed by a conveyor to a mixer to which the oil from a reservoir and, if desired, peptizing or other stabilizing agent from a preferably steam-jacketed tank is admitted by pipes. The mixt. flows to a ball mill and after it is blended is discharged to a separating tank to trap any coarse particles, and is forced by a pump to a reservoir preferably containing a heating coil. The outlet of the ball mill is preferably provided with a ribbed and ridged liner to agitate the outflowing mixt. and prevent the passage of coarse particles, and an agitator and a heating coil may be arranged in the reservoir. The stabilizing agent may be a lime-rosin or other metal soap, creosote, water-gas tar, a liquid combustible hydrocarbon immiscible with the liquid combustible, gas having peptizing action, or alkali to combine with acid constituents of the oil or coal. A modified form of app. also is described.

**Liquid fuel.** L. W. BATES. Brit. 155,210, Dec. 9, 1920. In fuels consisting of a blend of immiscible combustible liquids or of solid carbonaceous particles such as coal suspended in oil or other liquid, the stability of the blend is increased or prolonged by agitation, particularly during storage, whether a stabilizing agent has been added or not. A suitable construction is specified.

**Liquid fuel.** J. J. V. ARMSTRONG. Brit. 155,212, Dec. 10, 1920. A fuel comprises 35-70 parts of finely pulverized coal, coke, or other carbonaceous matter stabilized in 65-80 parts of oil or other liquid hydrocarbon by treating the mixt. for 1-2 hrs. in cross-pounding or other mills having a speed of at least 1000 m. per second. The process is accelerated by adding 1-3% of soap soln. or rubber soln. or other colloid to the mixt.

**Peat fuel.** T. A. GOSKAR. Brit. 155,012, Sept. 8, 1919. Peat is mixed with gritty material adapted to pierce its cell walls and the mixt. is compressed so that  $H_2O$  or sap escapes readily from the peat. The peat product may be coked.

**Motor spirit.** E. C. R. MARKS. Brit. 154,867, May 7, 1919. A motor spirit with a f. p. below -80° F. consists of 12 parts by vol. of benzene, 30 parts of gasoline, and 40 parts of abs. alc. Cf. 153,925 (C. A. 15, 1207).

**Gas.** L. WOLF. *Can.* 207,946, Jan. 25, 1921. A gas containing  $C_2H_2$  and oil gas is made by subjecting a hydrocarbon to the heat evolved by the formation of  $C_2H_2$  from carbide, the gases are combined and cooled to remove the impurities.

**Purifying gas.** C. E. HOLY and J. S. BURGOYNE. *Brit.* 154,742, Sept. 20, 1919. Naphthalene is removed from gas by passage through a vessel fitted with a wire gauze or other screen of helical form. The vessel consists of 2 frusto-conical parts, and the screen, which is of varying diam., has a coarser mesh at the inlet end than at the central part; the mesh in the part may increase in coarseness or not towards the outlet. The purification is regulated by varying the temp. of the vessel, and for this purpose a steam or water jacket is provided.

**Purifying coal gas.** H. C. MARRIS and W. WALKER & SONS. *Brit.* 154,961, Aug. 1, 1919. In the removal of S compds. from coal gas, a purifying mass is obtained by mixing spent vegetable matter from tanneries, a sol. compd. of Fe and spent CaO from tanneries. The mixt. results in the formation of  $Fe_2O_3$  or  $Fe(OH)_3$ , which remains in admixt. with the spent vegetable matter, leaving the whole in a porous condition, which facilitates the percolation of the gas. CaO from other sources may be used together with or instead of the spent CaO, or sawdust may be employed to replace the spent vegetable matter. CaO is always added in excess.

**Treating tar or pitch.** BARRETT Co. *Brit.* 155,226, Aug. 10, 1920. Coal tar or pitch, coke-oven tar, water-gas tar, etc., are distd. from a still in a circulating current of inert gas such as  $N_2$ ,  $CO_2$ , or CO to yield a pitch which has a high m. p. and does not foam on being coked. The gas is injected into the still through a perforated pipe and passes through a condenser and pump back to the pipe. The pitch is run from the still to a still in which it is coked at a temp. of  $700^\circ F.$  or higher.

**Coking.** C. C. BUSSEY. *Brit.* 154,658, July 29, 1919. In a vertical internally fired retort for use in the destructive distn. of coal, shale, and lignite, the charge is fed continuously and the coked product is discharged alternately in opposite directions. The retort is inclosed by metal sheets which retain a layer of asbestos to reduce radiation; a lining of fire-brick and a water-cooled ring. A suitable construction is specified.

**Coking.** E. FLEISCHER. *Brit.* 154,938, Dec. 7, 1920. Coal is coked in a vertical retort by a current of producer gas having an initial temp. of  $900^\circ$  or more. If the temp. is below  $900^\circ$ , part of the gas is burned at once. Air and steam are injected at the upper part of the retort to maintain a temp. of  $600-800^\circ$ .

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**Cracking of hydrocarbons.** I. YOSHINOBUKE NAKAGAWA AND SEIJI KAWAI. *J. Chem. Ind. (Japan)* 23, 453-85(1920); cf. *C. A.* 14, 219.—A critical study and review of all the methods known for detn. of aromatic hydrocarbons in petroleum oils are given. All these methods are systematically classified and the various expts. by N. and K. are added to each method. (1) Soly. method; (2) m. p. method; (3) distn. method are given in Part I. In Part II, *Ibid* 869-81; (4) sp. gr. method; (5) chem. methods are given. In Part III, *Ibid* 957-77, their own exptl. data are given. The conclusions are: As regards the distn. method, Rittman, Egloff, Sperr and other methods based on this principle are not quant. accurate. Since the compn. of the samples to be examd. her various effects on "cutting point," in the fractional distn., N. and K. exptd. on the relationship among compns. of the mixt., cutting points and amt. of distillate at the different temps.  $C_6H_6$  (b.  $80-1^\circ$ ,  $d_{15.6}$  0.8850) toluene (b.  $110-1^\circ$ ,  $d_4$  0.8711) and xylene (h.  $138-40^\circ$ ,  $d_4$  0.8619) were used in various proportions and distd. The results are given in 2 curves. In mixts. of benzene and toluene the amt. of distillate at  $85^\circ$  follows a straight-line curve when toluene is less than 50%. Cutting point  $x = 87.5 +$

1.38 (90— $y$ ),  $y$  = % of benzene. In mixts. of toluene and xylene,  $x = 117 + 1.08$  (90— $y$ ),  $y$  = % of toluene. A method is described by which the cutting point can be detd. for various mixts. of these 3 components by the use of the curve. This method is not recommended as final, as it requires more elaborate investigation, particularly in respect to the % of petroleum oil present. Since any criticism on this method, however, will apply to all other distn. methods, N. and K. consider this superior to the others. In all sp. gr. methods, calcn. of % of aromatic hydrocarbon is based on the assumption that the sp. gr. curve for mixts. of aromatic and aliphatic oils is a straight line. On mixing of 2 series of hydrocarbons, the liquid expands slightly, so that the actual sp. gr. is always less than that calcd. according to the law of mixts. This deviation depends on the kind of aromatic hydrocarbon and how much is present in the mixt. In general, the higher the sp. gr. of petroleum oil, the greater its deviation. The effect of  $H_2SO_4$  treatment of petroleum distillate and the sulfonation method for estn. of aromatic hydrocarbons in petroleum oils also were studied. The results show that there is deviation due to loss of petroleum hydrocarbons dissolved always in acid sludge—both chem. and mechanically. The general conclusion is that direct methods such as sulfonation and distn. are not so simple as they appear, while indirect methods such as sp. gr. and cryoscopy, are not so complicated as they are generally considered.

S. T.

Properties of typical crude oils from the eastern producing field of the U. S. E. W. DRAN. Bur. Mines, *Rept. of Investigations* 1921, No. 2202, 57 pp.—The preliminary report includes data showing the properties of 35 typical crude petroleum samples from the states of N. Y., Penna., W. Va., Ky., O., Ind. and Ill., including for comparison a few samples from several other states. Suggestions and constructive criticism are invited. 49 pages are devoted to tabulated data as follows: (1) sp. gr. at 60° F. and corresponding Baumé (based on modulus 140); (2) percentage of S (calorimeter bomb— $BaSO_4$ ); (3) percentage of  $H_2O$  (distn.); (4) distn. at atm. pressure with data for percentage distg. within 25° (45° F.) limits up to 275° (527° F.), and the sp. gr. and Baumé gravities of the fractions (Hempel distn. method, using 300-cc. charges of oil and distg. through a 6.5-in. fractionating column); vacuum distn. at reduced pressure of 40 mm. "absolute," of the residuum from the "air distn.," with data for the percentages distg. between 25° limits up to 300° (572° F.) and for the sp. and Baumé gravities. Also Saybolt Universal viscosities (at 100° F.) and Fahrenheit cloud tests of the distn. fractions; (6) Conradson carbon residue percentages of the residuum from the combined "air" and "vacuum" distns. The distn. fractions are reported as follows: (1) gasoline and naphtha = distillate below 200° at atm. pressure; (2) kerosene between 200° and 275°; (3) gas oil = sum of all vacuum fractions having Saybolt viscosities of less than 50 sec. at 100° F.; (4) light lubricating distillates having Saybolt viscosity between 50 and 99 sec.; (5) medium lubricating distillates having Saybolt viscosities between 100 and 199 sec.; (6) viscous lubricating distillates. Suitability of a crude for producing cylinder stock is assumed approx. inversely proportional to percentage of carbon by the Conradson test. The original must be consulted for details. J. ALEXANDER

The Dayton process. F. C. BINNALL. *J. Ind. Eng. Chem.* 13, 242-6 (1921).—A description is given with diagrams of plant and analyses of products of a process for making oil-gas by internal combustion of the oil with preheated air in a retort. The process is automatic and continuous and yields a gas without S, with high N, and of a const. predeterminable heating value of 300-560 B. t. u. per cubic foot. E. W. T

The dangers of oil fuel. ANON. *Chem. Age* (London) 3, 464-5 (1920).—This is an editorial review of the rept. of the Committee of the Board of Trade (Cmd. 944) appointed to inquire into means for preventing fire. The committee finds the main cause of trouble in the leakage of hot oil from joints in the pressure system leading to the burners and recommends that these be made of solid drawn steel and placed where they

are plainly visible, preferably at a height such that they can be readily inspected. When fire occurs it is advised that it be dealt with by means of sand, or saw-dust impregnated with  $\text{Na}_2\text{CO}_3$ , and in confined or dangerous spaces with a chem. extinguisher. As an additional precaution there should be an installation capable of discharging froth in large quantities into each boiler room and so arranged as to be operated from the outside. The flash point of the oil should not be below  $150^\circ \text{F}$ . The tanks or compartments carrying oil should be provided with vent pipes so placed that no danger will result from the vapor issuing from them, the openings being fitted with wire-gauze diaphragms which may be removed for cleaning or renewal. CHARLES E. MUNROE

Surface tension in the field of oils. D. HOLDE AND N. SINGALOWSKY. *Z. angew. Chem.* 33, 1, 267-8(1920).—An address. Although the importance of low surface tension values of substances to be used as lubricants was indicated by Ubbelohde (*C. A.* 6, 1986, 2521), no practical use has been made of this suggestion. Viscous mixts., such as molasses, inorg. salt solns., etc., have suitable viscosities, but they have too high surface tension values to be suitable as lubricants, even when the evapn. of  $\text{H}_2\text{O}$  is not troublesome. Anthracene oil has the same defect, and during the war a patent was announced by P. Eitner, covering the addition of petroleum pitch to this oil, to give a mixt. having a lowered surface tension. For the measurement of surface tensions of oils and of substitutes for raw and hoiled linseed oil, the stalagmometer of Traube was used. The wt. of a given number of drops (20 as a rule) was detd., care being taken that the drops were formed slowly (minimum of 2 sec.). Although the reliability of this method for viscous substances is disputed, its simplicity is greatly in its favor. H. and S. have found that the values which they obtained check satisfactorily with those detd. by other methods in the case of glycerol solns. and olive oil. Moreover, the detns. of 4 samples of viscous oils (one a coumarone resin distillate, sp. gr. 1.049, and the others normal mineral lubricating oils), agreed with those made on the same samples in the Reichsanstalt by 2 different methods: direct weighing with plates and contact and rupture methods. Good agreement with the data of Grunmach and Bein (*Wissenschaftl. Abhandl. der Kaiserlichen Normaleichungskommission*, 1919, No. 9; cf. *C. A.* 14, 1241) was obtained—in the case of several fatty oils. G. and B. used the capillary-plate method. The values (mg./mm.) for viscous oils from coal-tar produced at low temps. varied from 3.78 to 3.88, which are higher than those of normal lubricating oils from petroleum (3.10-3.20), but lower than that of untreated anthracene oil (4.37). The conclusion of Dallwitz-Wegner (*Petroleum* (Berlin) 16, 259 pp., 285 pp. (1920)), that bone-oil is a poor lubricant, is unsupported by data and is contrary to experience. D. HOLDE. *Ibid* 290.—A correction of the statement that Dallwitz-Wegner gives no data in support of his conclusion that bone-oil is a poor lubricant. D.-W. obtained a surface tension value of 4.11-4.15: mg./mm., which he regarded as unfavorable. All of the values reported by D.-W., detd. by the Procter Hall method, are higher than those of H. and his assistants. W. F. FARAGHER

Commercial aspect of the oil shale industry on the western slope. II. J. B. JENSON. *Salt Lake Mining Rev.* 22, No. 18, 21-5(1920).—Deals with title to property, examination, and assaying, water supply, retort and refinery sites, methods of mining and mine equipment, and initial costs of plant. A. H. HELLER

Some items of investment, expense, and profit in commercial shale-oil production. I. H. SHARP. *Bur. Mines, Repts. of Investigations* No. 2214, 3 pp.(1921). E. J. C.

Chemical engineering and economics in shale-oil recovery. ARTHUR J. FRANKS. *Chem. Age* (N. Y.) 29, 67-9(1921).—The problems of the shale-oil industry are outlined under the following heads: Carbonization of the oil shale; refining of the oil; development and utilization of the by-products. JEROME ALEXANDER

Plant design for hot-gas pyrolytic distillation of shale. LOUIS SIMPSON. *Chem. Met. Eng.* 24, 341-6(1921).—Illustrates a plant designed to retort 2000 tons of shale

each 24 hrs., based on the chem. principles accepted by the Scotch operators so applied as to conform to modern practice. The cost is estd. at about 61 cents per ton, which includes 15 cents each for interest and depreciation. JEROME ALEXANDER

**The eventual retort plant for the distillation of oil shales.** LOUIS SIMPSON. *Chem. Met. Eng.* 22, 71-2(1920).—The Scotch dual-purpose retort (*C. A.* 13, 2592) was designed to permit the eduction of the oil gases at a low temp. and the distn. of the  $\text{NH}_3$  at a higher temp., but it does neither satisfactorily. The oil gases should be taken out in one retort, then the shale ground so 98% will pass 200 mesh and later burned in a rotary cement kiln at 1125-1500°. Superheated steam should be blown into the kiln during the eduction of the  $\text{NH}_3$  and powdered coal, fuel oil, or gas used to raise the temp. of the kiln if there is not enough C in the de-oiled shale to heat it. If the  $\text{K}_2\text{O}$  of the shale is worth recovering this may be driven off at a temp. slightly above that needed for liberation of the  $\text{NH}_3$  and reclaimed by a Cottrell dry separator and in the  $\text{NH}_3$  absorbers.

H. S. BAILEY

**American vs. Scotch methods in retorting petro-shales.** J. B. JENSON. *Salt Lake Mining Rev.* 22, No. 20, 17-23(1921).—In Scotch plants fines are screened and discarded to avoid clogging of vapor outlets and to permit better passage of the gas. Problems of American practice are given, together with various products obtainable by varying conditions of retorting and refining.

R. H. HELLER

**Mining, equipment, crushing and retorting of western petro-shales.** J. B. JENSON. *Salt Lake Min. Rev.* 22, No. 19(1921).—Shale is slower in crushing and requires more power than ordinary brittle rock. J. recommends a combination of jaw crushers with rolls. The history of oil shale retorting is given.

A. H. HELLER

**Testing shale for oil and ammonia yield.** E. LAWSON LOMAX AND F. P. G. REMFRY. *Shale Rev.* 3, No. 2, 3-4, 14(1921).—Methods of sampling and prepg. shale samples are given. In the proximate analysis proper methods for detn. of hygroscopic water, total water, volatile org. matter and fixed carbon are given, which are similar to methods used for coal. In retorting for oil and ammonia yield the authors suggest the use of steam and describe with a diagram a suitable lab. app. Without steam the yield of oil is 20% lower. Methods for the N detn. are given. In the examn. of the crude oil, the general characteristics to be detd. are specific gravity, settling point, S, water and Engler flask fractionation. In refining the light fractions it is recommended, owing to usual high olefin content, that the oils be passed in a vapor state through heated fuller's earth, eliminating acid treatment, which should be used only on the heavier fractions containing less amts. of unsaturat. Tables and list of tests are appended showing the effect of weathering on shale.

A. H. HELLER

**Production of asphalt from crude oil.** J. I. DAVIDSON. *Petroleum Mag.* 10, No. 2, 39(1920).—"Natural" asphalt is practically all obtained from Trinidad and Venezuela, while "artificial" is made from domestic and Mexican crude oil. Domestic crude of paraffin base cannot be used, however. The oil is reduced in stills to asphalt of the proper consistency or penetration. This will give the usual products of distn., including lubricating distillates. The latter may, however, be sold as fuel if it is not desired to refine them. Steam is generally used in the stills, but the asphalt may be air-blown if a more brittle product is wanted. Asphalt is largely used for road construction, roofing paper and asphalt shingles.

R. R. MATTHEWS

**Powdered charcoal as a fuel.** CARLOS DÍAZ. *Informes dept. investigaciones ind. Univ. Tucuman* 11, 30-40(1920).—A number of different woods native to the Argentine Republic are subjected to destructive distn. in the lab. and the yields of various products obtained from each are presented in tabular form. The possibility of using the powdered charcoal as fuel in a manner similar to the use of powdered coal is discussed.

L. E. GILSON

**Plain talk on pine stump naval stores recovery.** J. F. CARTER, JR. *Chem. Age*



(N. Y.) 28, 421 (1920).—C. calls attention to millions of acres of cutover lands in the South that contain long-leaf-pine stumps. The chem. engineering problems regarding the recovery of rosin, turpentine, etc., from these are briefly discussed. C. advocates the "triple alkaline system," in preference to destructive or steam distn. or extrn. with volatile solvents. No data are given.

LOUIS E. WASS

Fuel wastes in oil-field boilers for drilling and production (AMBROSE) 21. Report of Administrative Chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada (wood waste) (MACALLUM) 13. The biological treatment of "oil-water" (KAMMANN, KEIM) 14.

Lubricating oils. F. C. THIELE and C. CORDES. Brit. 154,895, Nov. 12, 1920. Cylinder and other lubricating oils are obtained by digesting at about 300° asphaltiferous crude petrolums or petroleum residues with Florida earth, Kambara earth, or other hydrosilicate or with a substance containing hydrosilicic acid, followed, if necessary, by filtration through hydrosilicate. The hydrosilicate is regenerated by washing with benzene to remove oil and then with benzene, or  $\text{CCl}_4$  or  $\text{CS}_2$  to dissolve out the impurities.

### 23—CELLULOSE AND PAPER

A. D. LITTLE

Action of dilute mineral acids upon cellulose. A. WOHL and K. BLUMRICH. Techn. Hochschule, Danzig. *Z. angew. Chem.* 34, Aufsatzteil, 17-8 (1921).—From a study of the solution and residue obtained by the action of 0.5, 1 and 3%  $\text{HCl}$  upon cotton cellulose it is shown that in the slow hydrolysis through boiling with dil. acids, cellulose, like starch, splits off not only glucose molecules, but carbohydrates of higher mol. wt., which then suffer further hydrolysis to glucose. The results obtained by a study of the Cu no. are confirmed by the polarization values and the glucosazone detn.

C. J. WASS

The analysis of the mixed acids after the preparation of cellulose nitrate. E. BERL and W. VON BOLTENSTERN. Techn. Hochschule, Darmstadt. *Z. angew. Chem.* 34, Aufsatzteil, 19-21 (1921).—Total acidity is detd. by titrating 1.5-2.5 g. with  $\text{N}$  alkali with methyl orange as indicator. The total  $\text{N}$  acids are detd. in the neutral soln. by Arnd's method (*C. A.* 12, 662). The total oxidizable org. matter and  $\text{HNO}_3$  are detd. by adding an excess of  $\text{KMnO}_4$ , boiling a short time, cooling completely and titrating the excess of  $\text{KMnO}_4$  after addition of  $\text{KI}$  according to Volhard. The easily oxidizable matter and  $\text{HNO}_3$  are detd. by titrating with  $\text{KMnO}_4$  at 40-50° according to Lunge (*Ber.* 10, 1075). The org. substance alone is detd. by dilg. with  $\text{H}_2\text{O}$ , adding  $(\text{NH}_4)_2\text{SO}_4$  or urea, heating to boiling for 10 min., then heating with a slight excess of  $\text{KMnO}_4$  and titrating the excess. From these values formulas are worked out for various combinations. Detns. are given, showing the application of the method.

C. J. WASS

Cellulose mucilage. JESSIE E. MINOR. *J. Ind. Eng. Chem.* 13, 131-3 (1921).—M.'s conclusions are in the main in accord with those of Schwalbe and Becker (*C. A.* 14, 3790 (1920)). The formation of mucilaginous, sol. dextrins (reducing Fehling soln.) marks the first step in the hydrolysis of cellulose. The dextrins are adsorbed by the cellulose, forming an aggregate (hydrocellulose), (insol. in cold water?) and serve to catalyze the hydrolysis of cellulose (this would explain the fact that reaction velocity increases as the decompn. proceeds). "Mucilage" (which is distinguished from "hydrocellulose" because of "larger % of sol. adsorbed dextrins present") has a greater power of adsorbing water than has pure cellulose. Cold-water immersion of wood pulp causes very slow hydrolysis, but hot-water treatment apparently hastens hydrolysis

and rapidly destroys the mucilaginous products. Pulp with an original high Cu no. can be beaten to a mucilage more easily than those with a low Cu no., owing to the larger amount of catalyst present. The Cu no. of (bleached) pulp may be increased by cautious acid treatment before beating. Cellulose mucilage splits salts and adsorbs metallic ions more readily than does pure cellulose. The formation of mucilage aids in dyeing the cellulose.

L. E. WISK

**Test for unbleached sulfite and sulfate fibers.** R. E. LOFTON AND M. F. MERRITT. Bureau Standards, Washington. *Tech. Assoc. Papers*, Series III, No. 1; 1-7 (Dec. 1, 1920).—The difficulties to be overcome in developing a method for distinguishing between unbleached sulfite and sulfate pulps are due to the similarity of the pulps. As the raw materials from which these pulps are made are in general the same, the only distinguishable differences between the pulps are to be found in the 2 different digesting processes employed in their manuf. According to Schwalbe and others the differences which may be employed as a basis on which to develop reactions which will differentiate them are: (1) difference in the amt. of encrusting or ligneous material, and (2) different chem. changes which have been brought about by the different digesting processes. The various methods proposed by earlier experimenters are reviewed: Schwalbe's methods (staining with  $\text{Fe}_2\text{Cl}_6$  and  $\text{K}_4\text{Fe}(\text{CN})_6$ , and staining with a Cu salt and an org. dye), Klemm's methods (staining with malachite green, and staining with malachite green and then with rosaniline sulfate), and Fannon's methods (staining with an aq. soln. of rosaniline sulfate to which is added 1-3% of alc. and enough  $\text{H}_2\text{SO}_4$  to cause the soln. to take on a violet shade, and examg. either with the unaided eye or with the microscope). The method proposed by L. and M. consists in staining with malachite green and basic fuchsin (magenta). The stain is prepd. from 1 part of 2% aq. soln. of malachite green and 2 parts of 1% aq. soln. of basic fuchsin, and is mixed fresh a short time before using (not over a few hrs.). Owing to variations in the quality of dyes from various sources, after the stain has been made up it is necessary to test it on authentic samples of sulfate and sulfite, and to adjust the relative proportions of the 2 solns. in consequence. Sulfate fibers should have a blue, or blue-green color, and if any of them appear purple there is too much fuchsin in the mixt. and a little more malchite green should be added. All the sulfite fibers should have a purple or pink color, and if any of them show green or blue there is too much malchite green and more fuchsin should be added. The method of prepg. the samples and applying the stain is as follows: The sample is boiled in water or 0.5% NaOH and shaken thoroughly in a test-tube. Several fibers are placed on a microscope slide, dried with hard filter or blotting paper, 2 or 3 drops of the compd. stain added, the excess is removed with hard filter paper after 2 min., 3-4 drops of dil. HCl (1 cc. concd. HCl to 1 liter of distd. water) added, the excess removed with filter paper after about 10-30 sec., 3-4 drops of distd. water added, and the excess removed. If the excess of stain has not been all removed the washing with water must be continued; when it has been removed the cover glass may be put on. During the whole of the preceding treatment on the slide, the fibers are continually teased with the needle to ensure thorough contact with the various reagents. The color contrast not only enables one to detect the presence of one or both of these fibers, but is sharp enough to enable one, after some practice, to make an approx. correct estimate of the percentage of each of the fibers present. Results obtained on 7 known mixts. by 3 different analysts with 4 different makes of American dyes are given. A. P.-C.

**Rapid method of control analysis of the liquor in the manufacture of sulfate cellulose.** G. K. BERGMAN. *Pulp and Paper Mag.* 19, 11-2 (1921).—From the original black liquor 100 cc. are pipeted off, dild. to 1 l. with air-free cold water and filtered. 100 cc. of this soln. is cooled and titrated with HCl and phenolphthalein. The number of cc. necessary to destroy the rose color gives  $\frac{1}{2} \text{Na}_2\text{CO}_3 + \text{NaOH} + \frac{1}{2} \text{Na}_2\text{S}$ . Methylene orange is then added and the soln. is titrated to the end-point. This gives  $\text{Na}_2\text{CO}_3 +$

$\text{NaOH} + \text{Na}_2\text{S}$ . Direct titration with phenolphthalein as indicator after the addition of  $\text{BaCl}_2$  gives  $\text{NaOH} + \frac{1}{2}\text{Na}_2\text{S}$ . For the detn. of sulfides 50 cc. of 0.1 *N* iodine soln. was pipeted off, acidified with  $\text{CH}_3\text{COOH}$  and 25 cc. of the dild. sample added. Excess *I* is titrated with 0.1 *N*  $\text{Na}_2\text{SO}_3$  or  $\text{Na}_2\text{HAsO}_4$ . The error caused by the silicate and sulfite present is not particularly significant.

H. H. HARRISON

Advances in the electrical manufacture of paper. ANON. *J. Elec. West. Ind.* **46**, 128-9(1921).

C. G. F.

The chemical engineer and the news-print industry. R. W. MCKENZIE. *Can. Chem. Met.* **5**, 75-6(1921).

E. J. C.

Barks as raw materials for paper making: Malvaceae and moraceae suitable for paper making. CH. GROUND. *Papier* **24**, 4-8(1921).—Description of various species of mulberries (*Broussonetia*), and other Moraceae, and of various species of Malvaceae, together with a detailed description of the method of making paper by hand from the bark of the paper mulberry in Japan.

A. P.-C.

Dyeing paper. PAUL DE GUEHRY. *Paper Industry* **2**, 1683-5(1921).—Attention is called to the advantage of reduced dyestuffs and of mixts. to increase the precision of the beater engineer's weighings and obtain greater uniformity of product. Reduced dyestuffs are also useful where mottling may take place. Other ways of avoiding mottling are by adding the dye to the ground wood before the addition of the sulfite and by adding the dyestuff after the size and alum. Another defect, two-sidedness, occurs when acid colors are used where a suction roll is in operation.

H. H. H.

The preparation of hypochlorites for the bleaching of paper pulp. RAPHAEL SANSONE. *Rev. Univ. Papeterie* **3**, 13-4(July, 1920); 16-8(Aug., 1920); 13-6(Sept., 1920); 15-7(Nov., 1920); 16-8(Dec., 1920).—Description of various forms of equipment which may be used for the prepn. of bleach liquors from bleaching powder and for the prepn. of  $\text{NaOCl}$  bleach liquors.

A. P.-C.

The testing of cardboard: bulk and calendering. R. ISNARD. *Papeterie* **43**, 102-6(1921).—Bulk is the ratio of the vol. to the wt. of the cardboard; it is, therefore the reciprocal of the *d*. By measuring the length, width and thickness are obtained the apparent vol. and the apparent bulk,  $M_a$ ; and by measuring the vol. by immersion in water are obtained the true vol. and the true bulk,  $M_t$ . The difference between the two represents the vol. of air contained in the cardboard, and this is inversely proportional to the pressure exerted during calendering.  $M_a/(M_a - M_t) = K$  is called the *coeff. of calendering*. An example is given to show how the latter, together with a microscopic analysis, can be used to ascertain the nature of the stock and the treatment to which it was submitted, and thus det. its suitability for the purpose in view.

A. P.-C.

Better grades of straw board. RICHARD CLAYTON. *Paper Industry* **2**, 1540-1(1921).—Good bright straw must be used and uniformity of cooking conditions is essential. Nothing is to be gained by permitting the cooked straw to season for several days. The stock should be merely brushed out, as severe beating destroys the fiber and the Jordan or refining engine will suffice to break up the joints, chaff or lumps to pass through a number 35 screen. On the machine there must be ample "suction" and the sheet should be dried slowly in order not to form a harsh, flabby board which will break when bent.

H. H. HARRISON

Pulp evaluation as affected by the fiber ratio in the test sheets. C. L. BACHELDER. *Paper Industry* **2**, 1555-63(1921).—The method of evaluating pulp by obtaining the bursting strength of hand sheets has a number of objectionable features such as a personal equation, a machine direction to the fibers, and an uneven sheet. Good results were obtained by sinking the mold to the bottom of the vat and after the stock had been stirred carefully in order to eliminate currents and time had been allowed for violent agitation to cease raising the mold vertically. Better results were obtained by

use of a suction mold, whereby the inaccuracies from personal equation, machine direction, and uneven sheets are reduced to a minimum and the fiber direction, which is the controlling factor in strength test, is more nearly perfect than in sheets made by any other method.

H. H. HARRISON

Cotton cellulose (PUNTER) 24. Non-aqueous colloid systems—nitrocellulose (SPROXTON) 24. The effect of sulfite-cellulose wastes on the sewage of Königsberg (SCHUTZ) 14. Drying varnished paper (Brit. pat. 154,764) 1. Floor covering of paper pulp (Ger. pat. 320,661) 26.

Sizing, waterproofing, finishing, etc., paper, fabrics and the like. W. SCHMIDT and E. HÄUSER. Ger. 321,232, Mar. 15, 1918. Addition to 296,124. A tar soap soln., obtained by saponifying  $H_2O$ -extd. tar from wood, brown coal or hard coal is added to the paper pulp or incorporated with the fabric. A tar soap may also be used which has been obtained by saponifying tars freed from most of the acid constituents by distn. with or without steam. Further, a tar soap may be employed which has been obtained by the sapon. of the evapd. tar wash  $H_2O$  or partial sapon. of crude tar.

Short-time digesting in sulfite or sulfate digesters. J. K. RUTHS. U. S. 1,368,877, Feb. 15. See Brit. 144,084 (C. A. 14, 2986).

Precipitating organic substances in waste sulfite lye. H. B. LANDMARK. Can. 209,881, Mar. 29, 1921.—The sulfonic acid compds. in waste sulfite lyes are decompd. by means of a stronger acid under pressure. The stronger acid is produced previously or during the process by oxidation of the  $SO_2$  contained in the liquor by the introduction of air or  $O$  into the autoclave and by the discharge of elec. sparks therein.

Viscose compositions. H. GASSMANN. Brit. 155,211, Dec. 9, 1920. Viscose is impregnated with oil, fat, paraffin, resin or the like after coagulation, under the influence of heat. The coagulated viscose may be immersed in a heated oil bath, or when in the form of plates, may be sprinkled with the impregnating substance and passed between heated rollers. Prior to this treatment the viscose may be heated to prevent shrinkage during drying, *e. g.*, by clamping the edges of plates, etc., in a frame. The coagulated viscose may be washed with a salt soln. with or without heating to remove sol. impurities, the salt being afterwards washed out with  $H_2O$ . This minimizes swelling.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Cotton cellulose. Application to industry of recent researches on its viscosity. R. A. PUNTER. *J. Soc. Chem. Ind.* 39, 333-47T(1920).—A portion of the report on viscosity has been previously published (Gibson *et al.*, *cf.* C. A. 14, 2986, 2416). The applications of Gibson's results are given in this article. Large-scale expts. were undertaken with a view towards providing a more uniform, cheaper, and more suitable cotton cellulose for the manuf. of cordite R. D. B. and for the manuf. of nitrocellulose powder. The expts. are given in detail, and full tabulated data and graphs are included, especially those dealing with the *kiering* process. P. detd. the viscosities of cuprammonium solns. of raw cotton cellulose (which included English spinners' sweeps, American spinners' sweeps, Eastern spinners' sweeps, American willowed fly, American and Eastern cops) and of the materials purified under varying conditions of steam pressure, time, and strength of alkali and compared these viscosities with those of nitrated cotton prep'd. from the purified materials.  $Et_2O$ -alc. was used as solvent in the cellulose nitrate viscosity detns. and the falling-sphere viscosimeter method was employed. For details the original article should be consulted. P.'s work has permitted him to estab-

lish certain general principles, although quant. conclusions are not given. P. has shown that the cellulose of different raw materials has widely different viscosities. Even in the same fiber the cellulose is probably in different stages of mol. aggregation, which varies with age or growth. The essential treatment in purification of cotton cellulose is boiling with NaOH. Heat alone may effect a reduction in mol. aggregate of the cellulose, but the reaction is accelerated by the presence of  $H_2O$ —and more so by the presence of NaOH in soln. The changes (in mol. aggregation) of different raw materials are effected at different rates, but *under sufficiently drastic treatment* (with the temp. to which the cotton is subjected as the essential factor) *"the product from all sources of cotton is essentially the same."* This appears as "normal resistant cellulose retaining its properties as a colloid." Throughout nitration these colloidal properties are retained and bear a relation to those of the nitrate. Nitrate formation (depending on conditions of nitration) may or may not affect the aggregate, which is rendered capable of further modification, brought about by heating the nitrocellulose at different temps. Such modification is accelerated by the presence of  $H_2O$ . "Ultimately, as in the case of cellulose, the nitrocellulose undergoes no further change (in aggregation) unless accompanied also by chem. change." A definite relation exists between viscosity of the "ultimate" nitrocellulose and the viscosity of the cellulose from which it was prepd. The properties of "gel" formed from nitrocellulose (with or without gelatinizer) by means of solvents are dependent upon the physical properties of the nitrocellulose. These det. the methods and conditions of manuf. of the finished product. A practical qual. relationship has been established between the viscosity of the nitrocellulose and the solvent required for converting it into propellant powders, and this relationship may be quant. In practice, it has been shown that the colloidal properties of the raw material and the treatment given to it in purification are fundamental factors in producing the finished product. This same inference is made in regard to the production of any article requiring cellulose as raw material, and *depending upon the colloidal properties of the cellulose*. The influence of the results of P.'s investigations on the methods of manuf. of nitrocotton and cordite R. D. B. at the Nobel factories and at H. M. Factory (at Gretna) are outlined. A complete reorganization in the mills was effected (June 1, 1918) with establishment of a technical staff whose work included study of capacity of plant in relation to production, efficiency, and monthly process costing. Within 4 months, the av. total cost of production had been reduced by £13 per ton.

L. E. Wise

Nitrocellulose. R. ROBERTSON. *Chem. Age* (London) 3, 473-4(1920); *Engineering* 110, 572-4(1920).—Most modern propellants are colloidal in character owing to the nitrocellulose they contain and through malaxation they are produced as uniform non-porous masses which present an unbroken surface to the flames that ignite them and, even under pressure, continue to burn regularly from layer to layer. The possession of this property has permitted the use of guns of much lighter weight than for gunpowder and also has made it possible, by suitable choice of thickness of the propellant, to obtain very high velocities of the projectile, with variations of but a few ft. per sec. from round to round, without undue strain on the gun. To obtain the degree of regularity necessary for accurate shooting it is important that the dimensions of the finished propellant be maintained within very narrow limits. But the nature of the nitrocellulose used affects the shrinkage which takes place in the cord after it is squirted from the die, and, therefore, the colloidal properties of nitrocellulose, gelatinized by solvent, either volatile or non-volatile, are of great importance in the study of propellants. Hence work carried out has afforded a great deal of information on the nature of the solns. of cellulose and nitrocellulose. In general, these treatments which effect disruption of the mol. are found to lower the viscosity of solns. of both. The viscosities of the solns. have direct relations to the properties of the dried

colloid, but the urea colloid presents difficulties in assessing its physical properties. *Detns.* of toughness, hardness and resistance to crushing have not yielded much information. But success has followed the detn. of the quantity of solvent existing in the different concentric zones of the cross section of a grain of cordite, it being found that, as the nitrocellulose becomes dominant, a proportion is reached when the distribution of the volatile matter is no longer uniform but increases regularly from skin to core, the ratio of the content of volatile matter in the different regions remaining const., although the total quantity is reduced in the process of drying. This resistance to the migration of the solvent is some measure of the viscosity of the horny substance, and its regional detn. might, perhaps, assist in the investigation of the physical condition of other colloids.

CHARLES E. MUNROE

**Nonaqueous colloid systems with special reference to nitrocellulose.** F. SPROXTON. *Chem. Age* (London) 3, 474(1920).—Nearly all nitrocellulose solvents contain CO in a keto, ester or acetyl group,  $\text{Et}_2\text{O}$ -alc. mixts. being the most notable among the exceptions. Baker has held the soly. of nitrocellulose to be due to the dissociation of alcs. and the formation of an  $\text{Et}_2\text{O}$ -alc. complex. Gihson and McCall hold that the compn. of an optimum solvent for a nitrocellulose depends on the N content; the higher this is, the more  $\text{Et}_2\text{O}$  the optimum solvent requires. This may be true, but the compn. of the solvent may also be governed by some other factor, which usually varies with the N, such as HO groups, not all of which are esterified. Renker holds that cellulose dried by alc. retains traces of alc. at  $130^\circ$ . The HO groups in nitrocellulose may attract alc. mols. and the variations in the compn. of the optimum  $\text{Et}_2\text{O}$ -alc. solvent for various nitrocelluloses may be due to the difference in the no. of HO groups in them. The solvent power for cellulose esters can be studied by: (1) the viscosity detns., the assumption being that that solvent is the best which gives solns. of lowest viscosity; (2) detn. of transition temp., *i. e.*, the temp. at which a liquid or mixt. of liquids becomes a soln.; (3) detn. of the amt. of an indifferent diluent which may be added to a soln. before precipitation takes place; (4) detn. of the amt. dissolved from a sample of cellulose ester of incomplete soly. The colloid chemistry of the manuf. of solid celluloid is complicated and difficult. Contrary to a somewhat widespread belief, at no state of the manuf. does one deal with a sol, if a momentary formation at the surface of the fibrous nitrocellulose when the liquid solvent first comes into contact with it is excepted. The amt. of liquid solvent employed is less than the nitrocellulose would take up in its preliminary swelling if soaked in the solvent, and since the product of preliminary swelling is a gel, it follows that the whole of the manuf. of solid celluloid from nitrocellulose deals with the gradual transformation of a gel to a solid. This transformation is accomplished by loss of solvent, which involves loss in weight and in vol., while undoubtedly the mechanical properties of the finished material are influenced also by the amt. and character of the manipulation it receives in the plastic state.

CHARLES E. MUNROE

**Brisance and its calculation.** H. KAST. *Z. ges. Schiess-Sprengstoffw.* 13, 171-3, 181-4(1920).—Brisance, or shattering effect, of an explosive is greater as the pressure on the confining surface is increased and as the rate of evolution of pressure is increased; also as the coun. of energy, or cubic density of the explosive, ( $\Delta$ ) is increased. Hence the expression  $f \cdot \Delta / t$ , where  $t$  is time of detonation, is assumed to represent brisance. K. discusses various theories of brisance and shows that those that depend on results of the Trauzl test are to be rejected, as this test measures chiefly the energy content of an explosive, and is not greatly affected by  $\Delta$  or rate of detonation. The German "Stauchprobe" or copper-cylinder compression test is best adapted to measurement of brisance. The equations assumed to represent the explosive decomposition of 24 explosives are given, and values for gas vol., explosion temp., vol. of solid products, sp. energy ( $f$ ), and brisance ( $f \cdot \Delta / t$ ), calcd. therefrom are tabulated together with explt.

values for temp. of explosion, rate of detonation, Trauzl test and compression test. The comparison of calcd. energy and brisance with Trauzl and compression tests shows that the Trauzl-test results are in fairly good agreement with the sp.-energy values but not with brisance, while with only one exception the compression-test results vary directly with the calcd. brisance values. Results with TNT-NH<sub>4</sub>NO<sub>3</sub> mixts. are characteristic; the compression result for TNT is greater than for any mixt. of TNT and NH<sub>4</sub>NO<sub>3</sub> (which agrees with brisance values), while the Trauzl-test result increases with the NH<sub>4</sub>NO<sub>3</sub> content from 285 cc. for straight TNT up to 430 cc. for 22% TNT and 78% NH<sub>4</sub>NO<sub>3</sub> (agreeing with calcd. values for sp. energy). C. G. STORM

Regulation of explosives in the United States. CHARLES E. MUNROE. Bur. Mines, *Bull.* 198, 45 pp. (1921).—This is an historical review of the Federal Explosives Act of Oct. 6, 1917, which terminated and ceased to be effective on the approval, Mar. 3, 1921, of Joint Resolution No. 382, 66th Congress, 3d Session. The bulletin records the origin, history and administration of the act, giving details of instances of neglect, misuse and criminal use, together with statistics of production and exportation of explosives and of explosions in munitions and powder plants. CHARLES E. MUNROE

Proposed legislation governing explosives. ANON. *Coal Trade Bull.* 44, 151-5 (1921).—This bill has been prepd. for presentation to the legislature of Penna. It provides for a State inspection service. Detailed provisions are made for reporting accidents. The maximum quantity allowed in one magazine is 300,000 pounds of explosive, or 20,000,000 caps. Stored explosives must be completely enclosed in tight metallic, wooden, fiber or other suitable container. No provision is made for bulk storage under water, nor do the requirements of analytical and research laboratories appear to have been specifically considered. CHARLES E. MUNROE

Gasoline explosion at Memphis, Tennessee, January 24, 1921. D. B. DOW. Bur. Mines, *Repts. of Investigations* 1921, No. 2219.—This report describes the accident, its effects and the circumstances leading to its occurrence with a consideration of its possibilities and a review of the similar explosion at Ardmore, Oklahoma, in 1915 (Dunn, C. A. 10, 391). CHARLES E. MUNROE

Explosion in high-pressure compressed-air line. E. D. GARDNER. Bur. Mines, *Repts. of Investigations* 1921, No. 2218.—An account is given of an explosion on Oct. 20, 1920, at an Arizona copper mine, the cause of which is as yet undetd.; also a rehearsal of causes of explosions in compressed-air lines, with recommendations as to means of prevention is given. The quality of the oil used has an important bearing on the operation of the compressor, and is probably the most fruitful cause of explosions in receivers or air lines. CHARLES E. MUNROE

Effect of oxygen on the explosion limits of combustible gases and vapors. E. TERRES. *J. Gasbel.* 63, 785-92, 805-11, 820-5, 836-40 (1920).—Detns. have been made of the explosion limits of CO, H<sub>2</sub>, water-gas, coal gas, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, benzene and C<sub>6</sub>H<sub>6</sub> in air, in pure O<sub>2</sub>, and in mixts. of O<sub>2</sub> and air containing more O than air. In all cases, the lower limit was practically independent of the concn. of the O in the mixt., but the upper limit was higher as the content of O in the mixt. increased. A large amt. of exptl. data is given. J. L. WILEY

The dangers of oil fuel (ANON.) 22. The analysis of the mixed acids after the preparation of cellulose nitrate (BERLVON BOLTENSTERN) 23.

Explosives. CHAS. M. STINE. Can. 209,955, Mar. 29, 1921. Xylene is chlorinated in sunlight at 100° until an increase in weight corresponding to the formation of the dichloro deriv. has been attained. *p*-C<sub>6</sub>H<sub>4</sub>(CH<sub>2</sub>Cl)<sub>2</sub> is crystd. out and filtered and nitrated with HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> until a dinitro deriv. is obtained. This is heated with pure H<sub>2</sub>O under pressure until the Cl has been replaced by OH, and the soln.

is evapd. to obtain  $C_6H_5(CH_2OH)_2(NO_2)_2$  in well defined crystals, which is further nitrated to produce a powerful explosive.

**Match-head composition.** W. A. FAIRBURN. U. S. reissue 15,039, Feb. 15. See original pat. 1,360,283; C. A. 15, 600.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Standard methods for testing dyestuffs. WALTER M. SCOTT. *Am. Dyestuff Rep.* 7, No. 15, II, 14-6 (1920).—Dyes are classified with reference to their methods of application into: (1) Acid dyes, which are tested on silk in a  $H_2SO_4$  bath. The sample is entered in a luke-warm dye bath, the temp. increased to about  $90^\circ$  and at the same time the acid is slowly added in very small portions. Time, 30 min. Acid colors are best dyed at 2% and the blacks at 5%. (2) Basic dyes. These are tested on silk in an AcOH bath. Since they do not exhaust as readily as acid colors, the bath may receive its full amt. of acid and be heated nearly to boiling before entering the sample. Time, 30 min. The more concd. colors are dyed at 0.5%, others at 2%. (3) Neutral dyes will dye with AcOH but give better color on silk by dyeing at 1% in a weak soap bath. Time, 1 hr. near the boil. Alkali blue is first dyed at 2% with soap and  $Na_2SO_4$  and then brightened with AcOH. (4) Developed dyes. A general method is hard to give, The silk is dyed in a 10% bath, either with soap and  $Na_2SO_4$  as in the case of primuline. or with salt and AcOH as with any of the developed blacks. Time, 1 hr. near the boil. The color is then diazotized and developed, using  $\beta$ -naphthol for primuline and developed B for the blacks. (5) Direct dyes. These are made on cotton-back satin to test the dye on both silk and cotton. The bath should contain soap and  $Na_2SO_4$  or NaCl. Time, 1 hr. near the boil. All members of this group are dyed at 2% except blacks, which give best results at 5%. (6) Sulfur dyes, and (7) Vat dyes. With these 2 classes, follow standard dyeing at 5% both for colors and for blacks when the dye is in the powder form. (8) Mordant dyes. If in powder form, these are dyed at 2% on samples mordanted with chrome or alum. The members of the last 3 groups are so individually distinctive that each must be separately studied. The members of the 6th group are dyed in a bath reduced with  $Na_2S$  and containing a high % of salt; those of the 7th group are reduced with NaOH and hyposulfite; those of the 8th group are best applied in an acid medium to the previously mordanted sample. The dyed sample is divided into 6 portions, one is reserved for mounting and the others are subjected to 5 general tests: (1) immersed in soap soln. 15 min. at  $50^\circ$ , with 1% for acid colors and 10% for all others; (2) immersed in cold 1%  $H_2SO_4$  for 5 min.; (3) immersed in cold 1%  $Na_2CO_3$  for 5 min.; (4) immersed in cold water 16 hrs.; (5) light test. A standard dyeing of Victoria Blue B was exposed for 100 hrs. to June sunlight with a good circulation of air, the resulting bluish gray was used as a standard for fading. A strip dyed with Victoria Blue B was put out with every set of samples and all were exposed until the blue reached the standard shade of gray. For a standard print test 1 oz. of color was dissolved in 1 pint of water, or other solvent if necessary, and thickened with 1 pint of heavy gum soln. If the color is acid or basic it is printed on a silk patch; if direct it is tried out on both silk and cotton. The patches should be steamed in the regular steam boxes of the plant; the subsequent washing and finishing may be done in the lab. The standard print is scoured by immersion in 5% soap for 5 min. at  $55^\circ$ , while the discharge test is made by printing a polka dot pattern on top of the patch with 20% hyposulfite thickened with gum. This patch is also put through the regular plant processes with the exception of the final washing and drying. Explicit directions for making records are given. A card index and envelope system makes the records instantly available. Over 600 dyes, mostly of American manufacture, have already been tested and recorded.

L. W. RIGGS



**Standard dyestuff tests.** WM. D. LIVERMORE. *Am. Dyestuff Rep.* 7, No. 19, II, 27(1920).—L. comments on Olney's plea for standard dye tests, and, recognizing that the chief problem lies in the establishment of reliable standard and scales, suggests that the various associations of textile mfrs. and color producers appoint a joint committee to consider the problem, and if thought desirable to delegate the task of soln. to a group of competent chemists.

L. W. RIGGS

**Standardization of dyestuff intermediates.** ERNEST FVLEMAN. *J. Soc. Dyers Colourists* 37, 37-43(1921).—See *C. A.* 15, 757.

E. H.

**A general survey of wool-dyeing methods.** LOUIS A. OLNEY. *Am. Dyestuff Rep.* 8, No. 10, Sect. 2, 11-7(1921).

E. J. C.

**Substitute for  $\beta$ -naphthol in the preparation of direct azo colors, particularly of blacks.** FRANCIS A. M. NOELTING. *Bull. soc. ind. Rouen* 48, 348(1920).—Owing to the scarcity and high cost of  $\beta$ -naphthol various substitutes of vegetable origin were tried: tannins, cutches, logwood ext., etc. The concd. ext. of brazilwood of the Cie. Française des Extraits Tinctoriaux was the only product which gave satisfactory results. Zambesi black (Actiengesellschaft) was used for the tests. The black obtained by the use of brazil was a little yellower than with  $\beta$ -naphthol and fairly close to that obtained with resorcinol; the fastness was about equal to that of the dyes fixed with  $\beta$ -naphthol. The process has been successfully used on an industrial scale since 1915. Certain blues gave dirty indigo shades with cutch and grays with brazil. Zambesi black and brazil, in small amts., gave fairly satisfactory grays; but this has not yet been tried out industrially. Two % of brazil and 0.5% of 36° NaOH (both based on the wt. of the fabric) should be used.

A. P. C.

**Examination of *m*-toluenediamine.** WALTER E. HAOLEY. *Am. Dyestuff Rep.* 8, No. 6, II, 28(1921).—Two com. forms of toluenediamine are found in the trade; the hydrochloride containing about 63 and the base with about 93% of the diamine. The m. p. should be 99°, as not above 2%  $\text{Na}_2\text{CO}_3$  as an adulterant is found in the ash and may be detd. by extn. in a Soxhlet with abs. alc. The diamine is dissolved out and  $\text{Na}_2\text{CO}_3$  remains in the extractor. Direct detn. of the diamine is by titration with diazotized-*o*-toluidine, the end-point being detd. when filter paper spotted with this reagent no longer shows a red circle on the application of a drop of the soln. which is being tested. To prep. *o*-toluidine of 0.1 *N* concn. dissolve 5.35 g. in water nearly up to 500 cc., cool in ice-water, then add 10 g.  $\text{NaNO}_2$  and when dissolved add 15 cc. HCl sp. gr. 1.2. The soln. is made up to the 500 cc. mark with water. *m*-Toluenediamine is made up to 0.1 *N* by dissolving 6.1 g. in water up to 500 cc. By using 100 cc. of the *m*-toluenediamine in a test, each cc. of the diazotized-*o*-toluidine required for the reaction corresponds to 1% of the diamine.

L. W. RIGGS

**Aniline and its uses in the dyeing and calico-printing trades.** WILLIAM B. NANSON. *Cotton* 84, 390-3, 465-8, 555-8, 667-70, 741-4, 825-8(1920).—The author gives a brief history of aniline and a very complete resumé of its chemistry, manuf. and uses in dyeing and calico printing. The information as to processes of application, "discharges," "resists," drying and machinery used is comprehensive and is accompanied by many formulas and by illustrations.

NATHAN VAN PATTEN

**Diphenyl black printing.** WILLIAM B. NANSON. *Cotton* 84, 929-30(1920).—The methods of application, solutions used and results to be obtained with diphenyl black (*diphenyl black base* and *diphenyl black oil*, D. O.) are discussed.

N. V. P.

**Red liquor and acetate of aluminium.** WILLIAM B. NANSON. *Textile American* 34, No. 4, 61-6(1920).—Prepn. and use in dyeing, printing, mordanting and water-proofing are treated.

CHAS E. MULLIN

**Modifying influences in textile research.** LOUIS A. OLNEY. *Am. Dyestuff Rep.* 7, No. 19, II, 11-12(1920).—Figures to indicate strength are comparable and reliable only when made either on bone-dry material, or under standard conditions of

21% and 65% relative humidity. Moisture is often blamed when mildew is the real cause of observed tendering. The action of light is sometimes mistaken, as in the case of fire-escape ropes, the weakness first being attributed to the action of sunlight, but afterward found to be caused by the action of HCl and SO<sub>2</sub> fumes from the lair. The action of light profoundly changes the nature of wool fibers in their affinities toward dyes. Accurate quant. results are often impossible. Thus a given wt. of worsted yarn may weigh less after it has exhausted a 2% acid dye bath than before dyeing, on account of the solvent action of hot water. The hygroscopic character of the fiber may also be changed by dyeing.

L. W. RIGGS

**Purity of white cottons.** ED. JUSTIN-MUELLER. *Am. Dyestuff Rep.* 8, No. 6, II, 27-8(1921).—Cotton goods to remain white during the period between finishing and sale must be perfectly pure. Starch incompletely stripped is shown by the iodine test. Degree of purity is also detd. by measuring the speed of swelling and comparing with the speed of swelling of known pure fiber, by aid of an instrument called the turgometer (cf. "La Turgometric" Dunot and Pinat, Paris, 1917). Irregularity of twist affects both weaving and dyeing qualities. Regularity or irregularity of twisting can be practically detd. by turgometer tests.

L. W. RIGGS

**Bleaching of cotton warps.** GEORGE NAJAR. *Am. Dyestuff Rep.* 8, No. 6, II, 18-19, 25(1921).—The mechanical, physical and chemical conditions for bleaching cotton warps with chloride of lime are given in detail.

L. W. RIGGS

**Bleaching of cotton knit underwear with peroxide.** KARL R. MOORE. *Am. Dyestuff Rep.* 7, No. 19, II, 16-7(1920).—In bleaching these goods for light wt. it is necessary to scour off to an absolutely clean bottom. For heavy wts. which are half bleached this is not so essential. The goods from the knitting machine in roll form are placed in a string washer and run at 82 to 100 for 2 hrs. in a bath containing 2 to 3% of the wt. of the goods of Na<sub>2</sub>PO<sub>4</sub> and 1% pure coconut-oil soap. The soap must be frequently tested for tallow adulterations, by detn. of iodine number. With heavy wts. only, 0.25 to 0.5% NaOH must be used. After scouring wash twice hot and once cold. For bleaching a standing bath is used, the app. to contain no Fe. Two % Na<sub>2</sub>O<sub>2</sub> or 10 to 12% of Albion may be used, and H<sub>2</sub>SO<sub>4</sub>, 66° Bé., free from Fe, in the proportion of 5 acid to 4 peroxide. One percent Na<sub>2</sub>SiO<sub>3</sub> is added to throw the bath on the alk. side. If the goods contain wool, NH<sub>3</sub> is used in place of the silicate. The goods are run 3 to 5 hrs., depending on the wt. of the batch, at 50° to 70°, and are matched up to standard swatches. They are then rinsed 20 min. in warm very dil. (1 to 1000) H<sub>2</sub>SO<sub>4</sub> followed by a cold rinse.

L. W. RIGGS

**Preparing, spinning and weaving of ramie or rhea fiber and China grass.** ANON. *Text. Mercury* 63, 489-90, 516-8(1920).—The processes of decorticating, degumming, combing, drawing, spinning and weaving are reviewed with much detail. Degumming is at present done by a secret chem. process.

L. W. RIGGS

**Testing of woollen yarns.** WILLIAM DAVIS. *Textile American* 34, No. 4, 44-5 (1920).—A comparison of the single-thread and hank methods of testing yarns.

CHAS. F. MULLIN

**Textile threads from wood.** FRANK. *Papeterie* 42, 1106-13(1920); 43, 9-13, 50-4(1921).—So-called paper thread is not a true textile thread, but rather a very fine twine, and the fabrics made from it are plaited rather than woven. Artificial silk, like true silk, is a non-fibrous thread, while the ordinary textile threads, such as cotton, flax, etc., consist of relatively long fibers spun and twisted. The researches of Francis Beltzer have proved the possibility of the synthesis of cellulose fibers; but in spite of the wonderful results obtained it is probable that cellulose fibers will be obtained industrially from the natural wood fibers rather than from the synthetic product. A few of the general principles of the structure of plants and trees are briefly reviewed to show in what direction researches must be undertaken to arrive

at the desired result, which is the isolation of the fibrous network of the tree, and not of the ultimate cellulosic fibers.

A. P. C.

**Properties of colloids in relation to industrial processes.** S. A. SHORTRIDGE. *J. Soc. Dyers Colourists* 36, 299-304(1920).—Like a typical colloid, as gelatin, wool absorbs water from a moist atm. and swells. Absorption is greater at lower temps., consistent thermodynamically with evolution of heat. Unlike that of gelatin, the swelling of wool is limited by rigid structure. Upon this may be imposed strains which disappear on wetting, showing "elastic memory." Boiling water wipes out elastic memory. The ideal soap for wool is potash olive oil, which does not gelatinize and dissolves readily in tepid water; but soda soap from a low-melting olein is an efficient substitute, because its concd. soln. gelatinizes at approx. the m. p. of the fatty acid. In vegetable tanning the negative colloid tannin ppts. the positive colloid of the hides. Tanned leather and wool rubbed together assume respectively negative and positive charges. With raw hide and wool charges are reversed, indicating that the position in the elec. series is altered by tanning. In hides, as in gelatin, swelling through water-absorption is influenced by acids, alkalis and salts. Detergent action of soap as protective colloid may be augmented by other colloids, which also hinder pptn. of lime soaps.

H. C. C.

**Rapid method of estimating the reducing values of cellulosic substances.** R. KNIGHT AND L. THOMPSON. *J. Soc. Dyers Colourists* 36, 255(1920).—The method described differs from the usual one only in the estn. of the Cu. The reduced  $\text{Cu}_2\text{O}$  is dissolved in a  $\text{H}_2\text{SO}_4$  soln. of ferric alum. An equiv. amt. of the ferric salt is reduced by the  $\text{Cu}_2\text{O}$  and the reduced Fe titrated by a standard permanganate soln. The blank necessary in the usual method to det. Cu absorbed by the cellulose but not reduced is obviated. The time of analysis is greatly shortened, and the result can be checked by titrating the unreduced Cu in filtrate by a standard soln. of  $\text{TiCl}_3$ .

E. F. FICKETT

**Rapid method of obtaining copper value.** A. E. SUNDERLAND. *J. Soc. Dyers Colourists* 36, 304(1920).—The  $\text{KI-Na}_2\text{S}_2\text{O}_8$  and a rapid electrolytic method of estg. Cu are mentioned as alternative methods to the  $\text{KMnO}_4$ -ferric alum method of Knight and Thompson (cf. preceding abstr.). A note from K. and T. shows that Sunderland missed the point of using the  $\text{KMnO}_4$  method, the object of which was to det. the reduced  $\text{Cu}_2\text{O}$  only, thus obviating the necessity of running a blank where total Cu is detd. as in the KI and electrolytic methods.

E. F. FICKETT

**Bast fibers. II. Cellulose in bast fibers.** YOSHISUKE UYEDA. *J. Ind. Eng. Chem.* 13, 141-3(1921).—A continuation of U.'s work on Korean bast fibers (cf. C. A. 14, 2266). The % cellulose in bast fiber is a measure of its industrial importance. The cellulose content averaged (*air-dry* basis) 70.81% (Renker-Cross and Bévan's method); 64.93% (original Cross and Bévan's method); and 68.58% (Johnson and Hovey's method). Renker's modification of C. and B.'s method appears to be the most satisfactory from viewpoint of the textile chemist. U. also gives % furfural, and  $\alpha$ -cellulose in the celluloses isolated.

L. E. WISE

An industrial research association (CROSSLEY) 13. Sizing, waterproofing, finishing, etc., paper, fabrics, etc. (Ger. pat. 321,232) 23.

AMERICAN DYES INST.: **World Disarmament and the Master Key to Industry.** New York: 130 W. 42nd St. 52 pp.

FIERZ, HANS EDWARD: **Dye Industry.** Frederick A. Mason translator. London Messrs. J. and A. Churchill. 21s. For review see *Chem. Trade J.* 68, 121(1921).

**Dyes.** BROTHERTON & CO., W. MERRIDMAN and MERSEY CHEMICAL WORKS. Brit. 155,410, Oct. 11, 1919. A disazo dye is obtained by combining *p*-diazobenzene-azosalicylic acid with a  $\beta$ -naphthylaminesulfonic acid, such as the 2,5- or 2,6-monosulfonic acid or the 2,3,6-disulfonic acid. *p*-Diazobenzeneazosalicylic acid may be prepd. by combining diazotized *p*-nitroaniline with salicylic acid, reducing the nitro group and diazotizing the amino group formed. The product dyes cotton or wool red shades in acid baths; the dyeing on wool may be chromed.

**Dyeing unbleached cotton.** H. B. SMITH. U. S. 1,368,298, Feb. 15. Unbleached cotton goods which may contain motes, shives or leaf are run into a dyeing app., wet out and boiled with a substantive dye for 10 min., then NaCl is added as a mordant and boiling continued for 30 min.  $\text{Na}_2\text{O}_2$  is then added to the bath and the latter is allowed to stand for 30 min. longer and finally boiled for 15 min. and allowed to stand for 30 min. after this boiling. This modification of the procedure of U. S. pat. 1,199,745 (C. A. 10, 2987) gives better dyeings with some dyes such as blues, drabs and pinks than when the alk. oxidizing agent is applied as an earlier stage of the process.

**Fiber from Agave and similar materials.** R. QUIJANO. U. S. 1,368,750, Feb. 15. Fleshy plants of the *Agave* or similar genera are cut and crushed, the leaves are soaked in a soln. such as expressed juice and salt  $\text{H}_2\text{O}$  to remove the more readily sol. gums, the partially degummed material is washed and is then boiled with soda soln. or similar extractive material for removing the remaining gums.

**Impregnating compositions.** NORSK HYDRO-ELEKTRISK KVAELSTOFKARTSELSKAB. Brit. 154,570, Oct. 23, 1920. A mixt. of sulfuretted fatty oil and sulfuretted tar is used as an impregnating compn. for fabrics, etc.

**Fireproofing cotton and the like.** WHIP BROS. & TOD, LTD. Ger. 320,177, Aug. 2, 1914. Insol. metal hydroxides are sepd. on the fiber by the action of gases, and in certain circumstances with the application of pressure. *E. g.*, flannel is first impregnated with a Na stannate soln. of 45° Tw., passed between pressure rolls, and dried. The fabric is then passed through a finishing or other suitable machine in which steam and  $\text{CO}_2$  is conducted in the necessary amts. After the gas treatment has been finished, the material is washed and again dried.  $\text{SO}_2$  may be employed instead of  $\text{CO}_2$ . The moisture content of the material during the treatment with gas must be kept within such limits that salts cannot be dissolved out.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The physical chemistry of paint and varnish. R. P. L. BRITTON. *J. Oil Color Chem. Assoc.* 3, 131-47 (1920); *Chem. Age* 3, 446 (1920).—The livering of paints, abnormal skinning of varnishes, blooming of enamels, and most paint and varnish problems of the kind can probably be referred to physical chemistry. B. reviews the conditions of chem. homogeneity but physical heterogeneity of solids and liquids, surface and interfacial tension effects, etc. Interfacial tension is especially important in emulsions and in paints, where there is an extremely large surface of contact between pigment and vehicle; it largely detrs. the ease and fineness of grinding in enamels. Most paint liquids show practically negligible osmotic pressures, indicating high mol. association. Some of these liquids, classed as active, tend to dissociate or at least prevent association of dissolved substances; while others, including the mineral hydrocarbons, are inactive. Endosmosis perhaps offers an explanation of some seps. and thickening of paint products, dependent on whether the liquid of higher or lower liquid-pigment interfacial tension first wets the pigment. In a disperse system the surface energy of the disperse phase will tend to assume a minimum value by the concn. on its surface of substances from soln. This change is probably one that takes place in maturing

of varnish. Colloidal elec. charges may influence surface tension. Abnormalities in varnishes, especially with reference to driers, are often due to colloidal suspensions caused by cooling of the varnish below the critical soln. temp. This can explain the fact that excess drier causes retardation of drying. Some varnishes are analogous to supercooled liquids for which Tammann (*Z. physik. Chem.* 25, 439(1898)) showed that the presence of insol. substances affects the temp. of nuclei formation, and that powdered glass lowered it while powdered  $\text{SiO}_2$  raised it. This suggests the difference in behavior of various "inert" extending pigments. The action of certain solvents in tending to cause reversion of superfused substances to their cryst. condition explains the "sugaring up" of varnishes. Blooming, and the brittleness of old varnish films, are probably due to crystn. of unstable superfused solids; and this also gives an explanation of the improvement of varnish films caused by rubbing and polishing. Discussion of the paper follows. The cause of aggregation of pigments in paint vehicles is based on preferential wetting. A pigment which forms an emulsion and tends to "feed up" or liver when ground in oil may be prevented from doing so by first wetting with  $\text{H}_2\text{O}$ , and then wet mashing as in the case of replacing  $\text{H}_2\text{O}$  by oil in white lead pulp. A paint or paste of stable consistency can be formed by first wetting the pigment with that liquid which shows the lower interfacial tension with it. F. A. WERTZ

BERNDT, G.: Radioaktive Leuchtfarben. Braunschweig: Vieweg & Sohn. 108 pp. M. 7, 60 + Teuerungszuschlag. For review see *Z. physik. chem. Unter-richt* 33, 197(1920); *Physik. Z.* 22, 32.

MORRELL, R. G. AND WAELE, A. DE: Rubber, Resins, Paints, and Varnishes. London: Bailliere, Tindall and Cox. 12s. 6d. net. For review see *Chem. Trade J.* 68, 188(1921).

Iron compound suitable for use as a pigment. R. S. PENNIMAN, JR. and N. M. ZOPH. U. S. 1,368,748, Feb. 15. Metallic Fe is immersed in a suspension of colloidal  $\text{Fe}(\text{OH})_3$  in a soln. of an Fe salt such as  $\text{FeSO}_4$  or  $\text{Fe}_2(\text{SO}_4)_3$  and air is blown through the mixt. at a temp. of about  $60^\circ$  to produce a hydrated ferric oxide of non-cryst. form especially adapted for use as a pigment.

White titanium pigments. P. FARUP. U. S. 1,368,392, Feb. 15. An aq. suspension of an oxide or hydroxide of Ti is treated with sufficient  $\text{Al}_2(\text{SO}_4)_3$  to form a product which will contain about 2.5%  $\text{Al}_2\text{O}_3$ . Pptn. is effected with  $\text{Na}_2\text{CO}_3$  with agitation, the supernatant liquid is drawn off from the ppt. and the latter is washed and dried for use as a pigment. The Al compd. serves to stabilize the pigment against decomposing influences and compds. of Ca, Pb and Zn, such as the oxides, sulfates, carbonates, hydroxides and sulfides also may be used for this purpose.  $\text{NaOH}$ ,  $\text{NH}_4\text{OH}$ , sulfides or sulfates may be used as pptg. agents.

Apparatus for recovering shellac from shellac-laden air of spraying rooms. T. W. FOOTE. U. S. 1,368,426, Feb. 15. The material is collected on a filter or screen.

Paints; polishes. E. SCHOU and EMULSION AKTIESELSKABET. Brit. 155,398, Sept. 30, 1919. Emulsions of the kind described in 140,147 (*C. A.* 14, 2269), for use as paints or priming compns., are prepd. by the use of devices which act on the injection or atomizing principle so as to bring about the fine division of the oil particles by collision, friction, etc., of the particles upon each other or upon stationary or moving parts of the app., or upon injected air particles. The emulsions may be coned. by evapn. at ordinary or reduced pressure or by extg.  $\text{H}_2\text{O}$  by osmotic or other processes. Solid materials such as paraffin or other waxes, resins, fats, lacs, etc., are melted before being emulsified, and emulsions prepd. with these substances may be used for polishing wood, floors, leather, etc.

Japans. BRITISH THOMSON-HOUSTON CO. Brit. 155,427, Nov. 5, 1919. An

emulsion of asphaltic and oleaginous substances in a dil. alk. soln., as described in 121,533, is improved by the addition of a non-oleaginous colloid, such as glue.

Floor covering of paper pulp. J. H. P. LIGTERINK. Ger. 320,661, Oct. 12, 1918. See U. S. 1,348,571 (C. A. 14, 2993).

## 27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Sea-turtle fat. PIERAERTS. *Mat. grasses* 13, 5733-4(1921).—The fat of *Thalassolagus corticala* Rond is dark in color, fishy in odor and does not dissolve in 70% alc. even with heat. Some const. detd. by Zdarek in 1903 were as follows:  $d_{44.5}$  0.9098, solidifying point  $10^{\circ}$ ,  $n_{20}$  1.4677, sapon. no. 209, I no. 112, R. M. no. 4.6, unsaponifiable 0.96%. Consts. of fatty acids: solidifying point  $28.2^{\circ}$ , I no. 119, mean mol. wt. 268, acetyl no. 8.7, sapon. no. 203. M. Tsujimoto examd. the fresh oil of *Chelonia mydas* Linn with the following results:  $d_4$  0.9335, free fatty acids 1.17%, sapon. no. 193.8,  $n_{20}$  1.4769, I no. 127.4. Clupanodonic acid is present to the extent of 0.88%.

E. SCHERUBEL

Test for annatto in fats and oils. W. BRINSMAID. *J. Ind. Eng. Chem.* 13, 216-7 (1921).—In a 60-cc. test-tube 15 g. of fat, 15 cc. of  $\text{CHCl}_3$  and 15 cc. of NaOH soln. are shaken for a few min. and the tube is placed in a water bath until the emulsion is broken up. Paper pulp is added and the soln. stirred for  $\frac{1}{2}$  hr. on the steam bath and then filtered through a Gooch crucible. The annatto is absorbed by the paper pulp and this is then subjected to the usual test.

E. SCHERUBEL

Antioxidation of unsaturated fatty acids. I. W. FAHRION. Feuerbach-Stuttgart. *Chem. Umschau* 27, 153-60, 201-4(1920); 28, 5-7, 20-1(1921).—A summary of former work by F. (*Z. angew. Chem.* 4, 172, 540, 534(1891); 5, 171(1892); *Chem.-Ztg.* 17, 434, 521, 684, 1453, 1848(1893)) through which the following conclusions were reached: Unsatd. fatty acids with one double bond yield by oxidation only volatile products; fatty acids with several double bonds leave one intact, add O to the others and absorb some extra O to form an OH group, giving hydroxy acids, insol. in petroleum ether, sol. in alc. and benzene and on account of their double bond incline toward polymerization, while the presence of an OH group may cause formation of anhydrides. Oxidation proceeds in several stages simultaneously: the lowest oxidation stage is an ether-sol. reddish oil, the highest stage is a dark brown amorphous mass containing anhydrides, less sol. in ether than the first stage. The hydroxy acids combined with glycerol form oils of normal color. *Sardine oil*, 1 yr. old, had partly resinified and showed a decrease of 15% in I value, but contained only 4.8% hydroxy acids; from this F. concludes that the thickening of the oil was due to polymerization as well as oxidation. Such thickening takes place also in linseed oil when boiled in covered kettles at  $300^{\circ}$  to make printing oils. Such oils are sticky and can be drawn into long threads but do not form permanent emulsions with  $\text{H}_2\text{O}$ . A temp. of  $110$ – $120^{\circ}$  makes liquid hydroxy acids less sol. in ether and solid hydroxy acids less sol. in alc., probably by splitting off  $\text{H}_2\text{O}$ , since sapon. with excess of alkali restores the hydroxy acids. Ultimate analyses of various hydroxy acids from cottonseed, linseed, sardine and codliver oils are tabulated. It was also shown by expt. that the unsapon. matter in cottonseed oil is not oxidized, also that volatile acids of low mol. wt. are formed when soaps from oleic acids, cottonseed oil or cottonseed oil acids are oxidized by  $\text{KMnO}_4$ , and even by air oxidation, but then only in small amts. Hydroxy acids are somewhat sol. in acidified  $\text{H}_2\text{O}$  and cannot be completely salted out from their soln., so that soap lyes from oxidized oils contain part of the hydroxy acids, while the settled soap contains the remainder. A method for the detn. of these sol. hydroxy acids in lyes is outlined. Hydroxy acids were found also in beef tallow (0.13%), butter fat (0.14%) and olive oil

(0.18%). From the difference between the sapon. no. of hutter fat and the acid no. of hutter fat acids F. calcs. a R.-M. no. of 35.6, and he suggests that a simple method equal in value to the R.-M. no. could be developed by defining exactly the conditions under which the sapon. no. and acid no. are to be detd. Whether the small % of hydroxy acids that he found in hutter fat and tallow originated from linolic acid F. leaves undecided. He found linolic acid in lard by the following *modified Hazura permanganate* method. Saponify 10 g. of fat in a 1500-cc. porcelain dish with 10 g. NaOH, alc. and  $H_2O$ . Evap. and dissolve in 1000 cc.  $H_2O$ , boil and slowly add with stirring 10-25 g.  $KMnO_4$  (according to I no.) in the form of a 5% soln., boil again filter, acidify with HCl, remove the acid layer and boil the fatty acids with 1000 cc.  $H_2O$ . The dihydroxystearic acid is insol. in  $H_2O$ , but the tetrahydroxystearic acid,  $C_{18}H_{36}O_8$ —the oxidation product of linolic acid—(called sativic acid by Hazura) and azelaic acid, a small amt. of which also is present, are sol. in  $H_2O$ . Filter hot, make the filtrate weakly alk., concn. to 125 cc., and rinse warm into a separatory funnel; acidify with HCl and after cooling shake out with ether. If the fat contained only oleic acid, no solid, ether-insol. flocks are noticed, but if linolic acid was present, the sativic acid floats as a flocculent ppt. in the lower layer of the ether soln. Tallow and butter fat gave negative results by this method, but lard showed unmistakably a residue of sativic acid, m.  $152^\circ$ . This low m. p. (Hazura gives  $173^\circ$ ) is explained by the fact that several tetrahydroxystearic acids exist and that cottonseed oil, containing 50% linolic acid, yielded the same sativic acid, m.  $152^\circ$ ; thus F. considers the presence of linolic acid in lard as established, even for lard from animals not fed on cottonseed meal. F. also records an analysis of linoxyn from Esslingen, made by Fr. Grunder according to the Ger. pat. 26,8647—a golden yellow, transparent, dry, caoutchouc-like product of the following compn.: unsapon. matter 1.3%, fatty acids 24.1%, liquid hydroxy acids (sol. in ether), 57.1%, solid hydroxy acids (sol. in alc.) 0.1%, Hehner no. 82.9, I no. of fatty acids 61.8, I no. of hydroxy acids 33.7. In order to recover the missing constituents (Hehner no. is only 82.9) the aq. HCl soln. was evapd. and extd. with ether, yielding 4.6% additional liquid hydroxy acids of 34.2 I no. The residual KCl which still had a brown color, was next extd. with abs. alc., yield 7.0% dry ext., which represented solid hydroxy acids and glycerol. In a fresh portion of linoxyn were detd. volatile acids 4.1%, of 93 mean mol. wt., ash 0.05 and moisture 2.5%, giving a total of 101.15%. F. further sepd. the fatty acids into liquid and solid acids by the lead salt-ether method and found the I nos. of 70.7 and 12.0, resp., but the liquid acids deposited a considerable amt. of crystal of solid acids on standing.

P. ESCHER

Negative catalyzers for the hydrogenation of fatty oils. II. SRIICHI UENO. *J. Chem. Ind. (Japan)* 23, 845-64, 911-35(1920).—Negative catalytic power (anticatalytic included) of substances naturally present in catalyzers and those artificially added to it, is investigated. The method is essentially the same as reported in Part I (*C. A.* 13, 383), where negative catalyzers present in the fatty oils were studied. Over 200 expts. were conducted on hardening of oils and liquid waxes, detg. acid value, m. p.,  $n$ , sapon. no., iodine value, ratio no., and ash content of all the hydrogenated products. The catalyzers were carefully analyzed for their impurity before use. The conclusions are: The relative difficulty of hydrogenation depends on the kind and property of the oils. The hydrogenation is an exothermic reaction, the amt. of heat evolved depending on the iodine value of the oils, the velocity of the reactions and the age of the Ni catalyzer. The detn. of the negative catalytic power of the substances present in the catalyzer is more difficult than that of the substances in oils. The specific activity of Ni catalyzer depends upon the mode of its prepn. All of the 6 alkali metals act as negative catalyzers; Mg, Sr, Ba, Ca and Be retard it; Al, Ce, are negative catalyzers; a large amt. of Fe also retards it. Mn and Co are apparently, Cr is hardly negative; Zn, Cd, show negative reaction; Cu and Ph are poison; Hg retards; Ag, Tl, Bi and Sb

are, V, Sn, Ti, U and W are not poisons; Au, Pt, Ir and Os do not retard it; S and Se are poison, but Te is not to such an extent. Among Ni salts, Cl and  $\text{SO}_4$  act as pronounced poisons. Cyanogen and cyanides are strong poisons, as is P. Boric acid is not negative when added to the catalyzer, but is when present in oils. Presence of org. matter has no effect if treated at high temp. S. T.

**The hydrogenation of fatty oils and the manufacture of hardened edible fats.** O. BANNINGER. *Schweiz. Chem.-Ztg.* 1921, 1-11.—An address before the 10th annual convention of the Swiss Food Inspectors. A semi-technical discourse on the compn. of animal and vegetable oils and the history of contact catalysis, followed by a brief description of the pressing, refining, and hardening of edible oils and the manuf. of H. A table of "Constants" of peanut, sesame, cottonseed, fish, linseed, soy-bean, corn and castor oils before and after hardening is given. H. S. BAILLY

**New method for the separation of the highly unsaturated fatty acids in fish oils.** MITSUMARU TSUJIMOTO. *J. Chem. Ind. (Japan)* 23, 1007-10(1920).—T.'s method depends on the fact that the Li salts of the highly unsatd. acids are exceedingly sol. in acetone containing 5% of  $\text{H}_2\text{O}$  by vol., while those of satd. or less unsatd. acids are not. The process is as follows: 5 g. of fish-oil fatty acids freed from unsapond. matter are accurately weighed into a flask and are dissolved in 20 cc. of anhydrous acetone and neutralized with 4 N LiOH with phenolphthalein as indicator. The vol. of alkali used is denoted by  $a$ . Next (6— $a$ ) cc. of  $\text{H}_2\text{O}$  and 75 cc. of acetone are added and left corked for 2 hrs. on ice. The soln. is filtered through a dry filter paper, the funnel being packed with ice. Then 50 cc. of the filtrate at room temp. is pipeted off, the acetone is evapd., and the residue is decompd. with dil. HCl. The free acid is extd. with ether and dried with anhydrous  $\text{Na}_2\text{SO}_4$ . The ethereal soln. is evapd. and its residue is weighed; this represents the amt. of highly unsatd. acid contained in 2.5 g. of the original sample. The results obtained from the different fish oils are given in a table, compared with the data obtained by T.'s original polythromide method. The data show that vegetable oils and oils from terrestrial animals contain comparatively little highly unsatd. acid (1.2% for sesame oil, 9.3% in linseed oil). Certain precautions are given for the method for an oil which contains a large quantity of these acids. T. adds a new formula for *clupanodonic acid*, obtained from Japanese sardine, which is not a pure chem. compd. as T. originally supposed. The chief unsatd. fatty acids in the oil contain  $\text{C}_{10}\text{H}_{18}\text{O}_2$  and  $\text{C}_{12}\text{H}_{22}\text{O}_2$  ( $\text{C}_n\text{H}_{2n-10}\text{O}_2$  series). Clupanodonic acid should be  $\text{C}_{12}\text{H}_{20}\text{O}_2$ , not  $\text{C}_{11}\text{H}_{18}\text{O}_2$  ( $\text{C}_n\text{H}_{2n-8}\text{O}_2$ ) as T. originally suggested. S. T.

**Vegetable carbons in the oil-refining industry.** B. W. GLICK. *Cotton Oil Press* 4, No. 10, 41-2(1921).—From materials, either carbonized or readily carbonizable, containing little ash, chars for decolorizing solns. have been developed equal to or better than bone charcoal. Most of these new chars are vegetable and are made by burning under conditions supposed to "activate" the carbon, then leaching out the mineral matter. In oil bleaching it is improbable that chars will entirely replace fuller's earths, but they are being used with earths to good advantage. Carbons active for gas absorption are usually poor bleaching agents. Also a char good for glycerol will often be useless for sugar solns. or oils. Most color substances are of a colloidal nature and, therefore, exhibit elec. properties. When fuller's earth is suspended in water and electrolyzed the particles move toward the anode, which indicates that it behaves like a colloid with a negative charge. Work with dyes of known electrical potential shows that fuller's earth is particularly active for the removal of dyes with + charges and useless with those having -- charges. Similar tests with active chars show that carbon will absorb varying amts. of both + and -- colloidal matter. Most carbons act more strongly on colloids. With cottonseed and peanut oils a mixt. of fuller's earth and carbon is more effective than either alone, but with coconut oils the char alone is necessary. H. S. BAILLY



**The relative effectiveness of several organic solvents for the extraction of vegetable oils.** A. F. SIEVERS AND T. D. MCINTYRE. *Cotton Oil Press* 4, No. 10, 44-5 (1921).—To ascertain the quality of oil extd. by  $\text{Et}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{CCl}_4$ ,  $\text{C}_2\text{HCl}_3$  and light and heavy gasoline from soy beans, peanuts, corn germs, and cottonseed, such exts. were made and tested. Six portions of a sample of each of the above oil materials were extd. cold with successive quantities of the solvents, the solvents evapd. and steamed out, and the refining loss, free fatty acids and color of the crude, refined, bleached, and deodorized oils detd. With soy beans the free fatty acids were highest in the  $\text{C}_6\text{H}_6$  ext. and decreased in the following order:  $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$ ,  $\text{C}_2\text{HCl}_3$ ,  $\text{CCl}_4$ , light gasoline heavy gasoline. The refining loss with heavy gasoline was 8.8 with  $\text{C}_6\text{H}_6$ , 8.5; light gas 8.4;  $\text{C}_2\text{HCl}_3$ , 8.3;  $\text{CCl}_4$ , 7.8 and 4.9 with  $\text{Et}_2\text{O}$ . The free fatty acids of all the peanut exts. were below 0.5%, varying from 0.49 for heavy gasoline to 0.21 with  $\text{Et}_2\text{O}$ . The refining losses were  $\text{Et}_2\text{O}$ , 11.8; heavy gasoline and  $\text{CCl}_4$ , 3.3;  $\text{C}_2\text{HCl}_3$  and  $\text{C}_6\text{H}_6$ , 3.2; and light gasoline, 2.8. With corn germs the free fatty acids were  $\text{C}_2\text{HCl}_3$ , 2.37;  $\text{C}_6\text{H}_6$ , 2.29;  $\text{Et}_2\text{O}$ , 2.23; light gasoline and  $\text{CCl}_4$ , 1.90; and heavy gasoline, 1.39. Refining losses on  $\text{Et}_2\text{O}$  ext., 11.1;  $\text{C}_6\text{H}_6$ , 10.7;  $\text{CCl}_4$ , 10.0; heavy gasoline, 9.2; light, 8.6; and  $\text{C}_2\text{HCl}_3$ , 7.6. The  $\text{Et}_2\text{O}$  ext. from cottonseed contained 2.61 free fatty acids;  $\text{C}_2\text{HCl}_3$ , 2.01;  $\text{C}_6\text{H}_6$ , 1.78,  $\text{CCl}_4$ , 1.36; light and heavy gasoline, 1.09. The refining losses were heavy gasoline, 13.5;  $\text{Et}_2\text{O}$ , 13.0;  $\text{C}_6\text{H}_6$ , 10.7; light gasoline, 10.6;  $\text{CCl}_4$ , 7.9; and  $\text{C}_2\text{HCl}_3$ , 6.7.  $\text{C}_2\text{HCl}_3$  exts. the most color from soy beans, peanuts and cottonseed, but produces lighter oil from corn germs than either  $\text{C}_6\text{H}_6$  or heavy or light gasoline. The color of the crude oils is, however, no indication of what may be expected in the refined or bleached oils. With  $\text{C}_2\text{HCl}_3$ , for instance, the crude soy and peanut exts. were the darkest in each case, but after proper bleaching were nearly the lightest in each set. The extd. peanut oils were, after bleaching, nearly water-white in spite of the fact that the red skins were only partially removed. "It seems that the selection of solvents is almost entirely one of cost and that the question of performance is of secondary consideration."

H. S. BAILEY

**Composition of herring oil.** CL. GRIMME. *Inst. angew. Bot., Hamburg. Chem. Umschau* 28, 17-19 (1921).—The consts. of a dark brown herring oil are tabulated and from detns. of the di-, tetra-, hexa- and octa-bromides of the unsatd. liquid acids G. calcs. the following compn.: 20% satd. fatty acids, 20% oleic, 33% linolic, 17% linolenic and 9% clupanodonic acid. By Tsujimoto's method of dissolving the Li clupanodonate in 95% acetone, G. found 14.86% unsatd. acids of an l no. of 317.65. P. RSCHER

**The Otoha nutmeg.** ANON. *Bull. Imp. Inst.* 18, 168-71 (1920).—The kernels of *Myristica otoa* yielded 7.2% of a nearly colorless oil when distd. with steam. The consts. of the oil are:  $d_{20}^4$  0.894, optical rotation  $[\alpha]_D^{20}$  79.44°,  $n_D^{20}$  1.502, acid value 13.6, ester value before acetylation nil, ester value after acetylation 20.0, sol. in 16 vol. 90%  $\text{EtOH}$  at 15°. The oil is deficient in certain odoriferous constituents and does not correspond in compn. to the com. nutmeg oil. The kernels yielded 61.7% fat which was a pale yellow and fairly hard. The fat m. 37.8°, sapon value 198.9, I value 20.1, and somewhat resembled the fat of ordinary nutmegs. The fat is of value in the treatment of skin diseases.

R. L. SIBLEY

**African oil palm nuts from Ceylon.** ANON. *Bull. Imp. Inst.* 18, 167-8 (1920).—The fruit was composed of 23% pericarp and 77% nut. The pericarp contained 4.5% moisture and yielded 62.7% oil (equiv. to 65.6% on the dry fruit). The nuts yielded 57.8% oil (expressed on the dry kernel). Analysis of the oil is not given.

R. L. SIBLEY

**Curua palm oil.** ANON. *Bull. Imp. Inst.* 18, 172-4 (1920).—The fruits identified as those of *Attalea spectabilis* were composed of 15.5% pericarp, 13.2% kernel and 71.3% shell. The pericarp yielded 2.9% fat and was of a greenish color and semi-solid. The kernel yielded 62.5% of a soft pale cream-colored product possessing the following

characteristics:  $d_{40} 0.8893$ ,  $n_{40} 1.447$ , acid value 1.2, sapon. value 259.5, I value 8.9, unsaponifiable matter 0.36%, insol. volatile acids 15.6%, sol. volatile acids 6.26%, m. 23.6°, solidifying point of fatty acids 24.6°. The meal left after extrn. of the fat was analyzed with the following results: moisture 8.9%, crude proteins 16.8%, fats 0.1%, carbohydrates 52.8%, fiber 15.1%, ash 6.3%, food units 95. The meal should be nearly equal in value as a feeding stuff to palm-kernel meal. R. L. SMILEY

Australian sandalwood oil. ANON. *Bull. Imp. Inst.* 18, 162-6(1920).—A sample of Australian sandalwood oil (*Fusanus spicatus*) possessed the following consts.:  $d_{15} 0.958$ ,  $[\alpha]_D -0.25^\circ$ ,  $n 1.503$ , acid value 2.9, ester value (after acetylation) 170.8, ester value (before acetylation) 4.7, total alcohols ( $C_{15}H_{34}O$ ) 76.3% insol. in 70% EtOH. Distn. under 12 mm. pressure lowered the % of total alcohols due to decompn. which did not take place on steam distn. The consts. are not, however, comparable with the East Indian sandalwood (*Santalum album*) and the oil could not replace it until the therapeutic actions of the 2 oils are proved to be identical. R. L. SMILEY

Observations on the choice of resins used in soap. R. SANSONE. *Mat. grasses* 13, 5727-8(1921).—It is important to have a simple test which indicates the color of soap produced by a resin; the following gives good results: Saponify 10 g. of the sample and 10 g. of a satisfactory resin separately with NaOH and note the color. Add a definite amt. of each of the resin soaps to a white soap and observe the color when cold. This procedure has the following advantages: (1) The purchase of dark-colored resin is avoided when a clear-colored soap is desired. (2) When a resin producing the clarity desired is found, the amt. in the soap can be increased without affecting the color. (3) In the event of matching dark-colored resin one can det. what proportions to use in a clear soap simultaneously with a resin of a brighter color. (4) Resin can be graded as to its suitability for light or dark soaps. (5) It can be detd. whether a highly colored resin can be corrected by the addition of silicate of soda. (6) In the choice of a resin the soap maker can know whether it is of advantage to use a higher-priced product or whether a darker product in lesser amt. is satisfactory. E. SCHERUBEL

Guides to analyses. IV. Interpretation of soap analyses. J. R. POWELL. *Chem. Bull.* (Chicago) 8, 6-7(1921).—Discussion of the components of interest in soap under the following headings: fillers, moisture, character of the fats, aging problems and specifications. E. SCHERUBEL

Report on edible fats and oils (KERR) 12. Development of the protein and fat content in oil-seed and fiber plants (KLEBERGER) 11D.

Purifying oils and fats. K. H. VAKIL. *Brit.* 155,020, Sept. 9, 1919. Vegetable, fish, and animal oils and fats are deodorized and refined by bringing them at temps. between 220° and 300° into intimate contact with  $CO_2$  alone or mixed with N, the free fatty acids and other odoriferous substances thus being volatilized. The oil is heated to the requisite temp. by passage through a heat exchanger and an elec. heater and is led through a distributing pipe to a refining tower, in which it meets an ascending current of  $CO_2$ , heated, if necessary, by a heater. A rotary pump is provided for circulating the partly refined oil. The  $CO_2$ , together with the volatilized fatty acids, passes through a separator to a heat exchanger and then, after admixt. with steam in a jet, to a second condenser. The fatty acids are condensed and collected in receivers. The gases may be scrubbed with oil in a scrubber and are either led to a gas-holder or are returned through heat exchangers to the tower. The prior use of temps. of 110-220° and 350-400° is referred to.

Cleansing compositions. C. F. TOWNSEND. *Brit.* 154,843, Apr. 20, 1920. A detergent for cleaning woolen, silk and dyed fabrics, consists of 4 parts of crystd.  $Na_2SO_4$  mixed with 6 parts of powdered soap. For cleaning undyed cotton and linen fabrics

the proportions used are 5 parts of  $\text{Na}_2\text{SO}_4$ , 3 parts powdered soap, and 12 parts of an alk. salt, preferably dry  $\text{Na}_2\text{CO}_3$ .

### 29—LEATHER AND GLUE

ALLEN ROGERS

Chrome tanning. II. The determination of the basicity figure of one-bath chrome liquors. DONALD BURTON AND ARTHUR M. HEY. *J. Soc. Leather Trades Chem.* **4**, 272-5(1920); cf. *C. A.* **15**, 1087.—It is shown that  $\text{CO}_2$  functions as an acid in a chrome liquor and that the present method of detg. the acid is therefore inadequate since it fails to take account of this and other volatile acids. In the detn. of basicity figures of one-bath chrome liquors, it is recommended that the acid shall be detd. by adding the  $\text{NaOH}$  to the diluted liquor in the cold, and that the addition shall be continued during the period of beating up to the h. p., and then until the pink color persists after 1 min. boiling.

I. D. GARARD

Properties of colloids in relation to industrial processes (SHORTER) 25.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Action of light on rubber. B. D. PORRITT. *India Rubber J.* **60**, 1159-62(1920).—The article contains abundant references on the subject, and gives the results of several expts. The changes in rubber are measured entirely by changes in viscosity of the resulting solns. The protection afforded rubber from deterioration by ultra-violet light, by dyes or colloidal  $\text{PhS}$ , is discussed. Differences in milling time seemed to make but little relative difference in its aging properties. It is pointed out that metallic oxides are necessary in dry heat vulcanization while with vulcanization with  $\text{S}$  only, the absence of air gives best results. P. gives a summary of the possible effects on aging of  $\text{S}$ ,  $\text{O}$  and actinic light.

A. H. SMITH

Preliminary note on the absorption of light by caoutchouc. S. JUDD LEWIS AND B. D. PORRITT. *J. Soc. Chem. Ind.* **40**, 18T(1921).—The raw material was prep'd. by extg. the crude rubber with water,  $\text{Me}_2\text{CO}$  and abs.  $\text{EtOH}$ , at room temp., transferring the residue to a separatory funnel, and dissolving the rubber in anhydrous  $\text{Et}_2\text{O}$ . A small plug of asbestos was used in the funnel to hold back the proteins or other insol. matter. A chart is given showing the absorption of a 3% soln. in a cell of 1 cm. The extinction coeff. becomes less with increase in wave length, the curve showing a sharp break above 2700.

J. B. T.

Determination of antimony in rubber goods. S. COLLIER, M. LEVIN AND J. A. SCHERRER. *India Rubber J.* **60**, 1297-8(1920); *Rubber Age* **3**, 104.—A method for the above is given in complete detail, tables of results of various preliminary expts. being shown. The procedure is essentially as follows: the compounded rubber is extd. with  $\text{Me}_2\text{CO}$  and  $\text{CHCl}_3$  and then decompd. by prolonged beating in cymene at 130-140°. The cymene soln. is dild. with petroleum ether and filtered through a Gooch crucible, as little as possible of the residue being transferred to the crucible. After thorough washing with petroleum ether, the residue is treated with concd.  $\text{HCl}$  and filtered through the same crucible. The resulting  $\text{Sb}$  soln. is pptd. with  $\text{H}_2\text{S}$ , filtered and transferred to a Kjeldahl flask, heated with  $\text{H}_2\text{SO}_4$  and  $\text{K}_2\text{SO}_4$  until colorless, dild. and reduced with  $\text{SO}_2$  produced by the addition of  $\text{Na}_2\text{SO}_3$  and after elimination of the excess  $\text{SO}_2$  is titrated with  $\text{KMnO}_4$ .

A. H. SMITH

